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Cook et al.

(10) **Patent No.: US 12,084,853 B2**
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(54) **REINFORCED FLOORS FOR MODULAR BATHROOMS**

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(73) Assignee: **Tile Redi, LLC**, Charlotte, NC (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 284 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **17/483,138**

(22) Filed: **Sep. 23, 2021**

(65) **Prior Publication Data**

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(51) **Int. Cl.**
E04B 1/348 (2006.01)
E04F 15/02 (2006.01)
E04F 15/10 (2006.01)

(52) **U.S. Cl.**
CPC ***E04B 1/34869*** (2013.01); ***E04B 1/34815*** (2013.01); ***E04F 15/02188*** (2013.01); ***E04F 15/10*** (2013.01)

(58) **Field of Classification Search**
CPC .. E04F 15/02188; E04B 1/06; E04B 1/34869; E04H 1/1244; E04H 1/1266; E04H 1/005; E04H 1/1216; A47K 3/284; A47K 3/40; A47K 3/30; A47K 4/00; A47K 11/04
See application file for complete search history.

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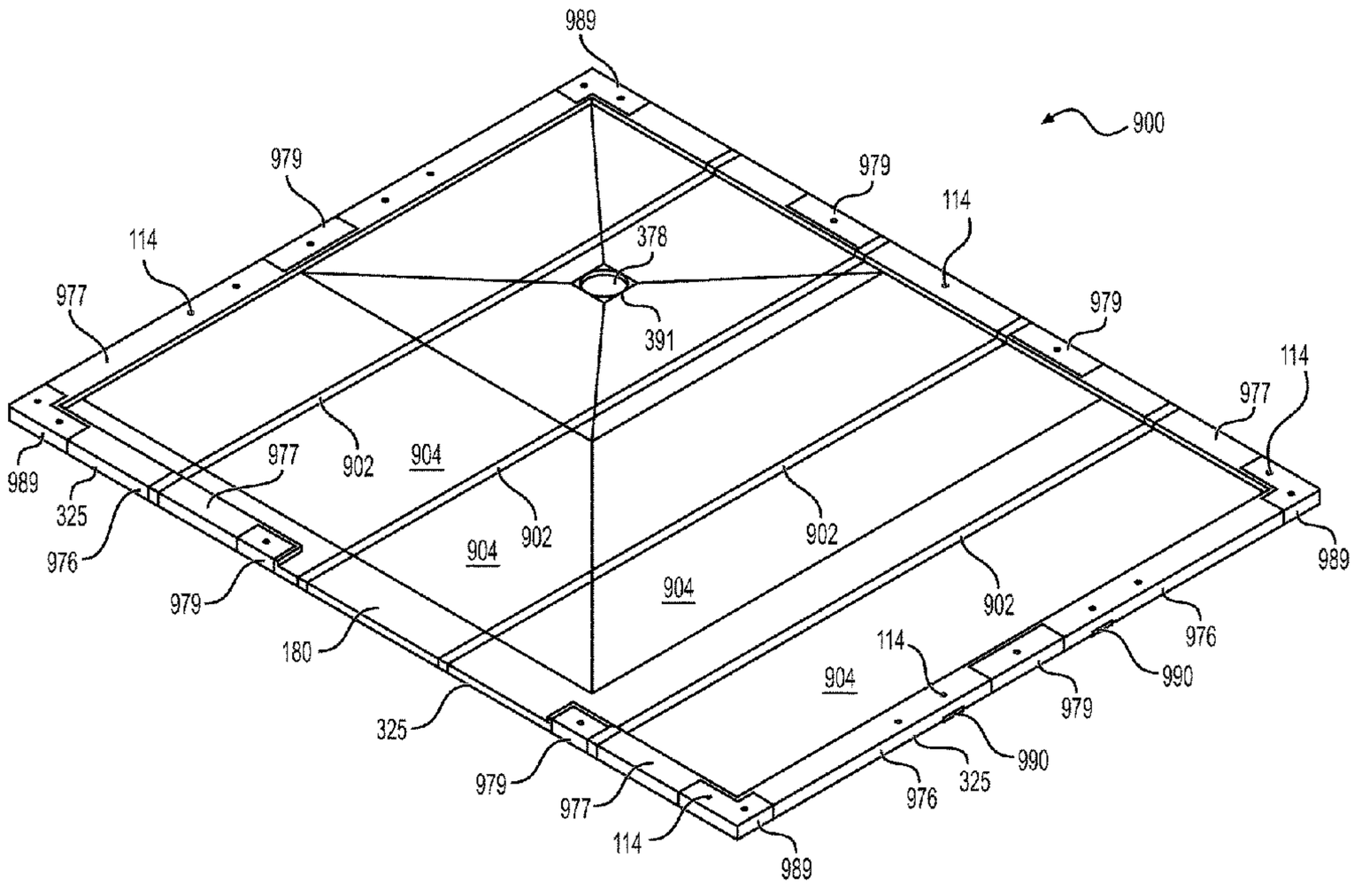
(57) **ABSTRACT**

Reinforced floor components of prefabricated bathroom pods. The floor components are reinforced and integrated into bathroom pods or other building units in such a manner as to add significant strength to the bathroom pods to resist bending, twisting and sagging, and/or to aid in lifting and supporting the weight of the bathroom pods, and thereby add to the structural integrity of the prefabricated bathroom pods to which they are attached.

11 Claims, 73 Drawing Sheets



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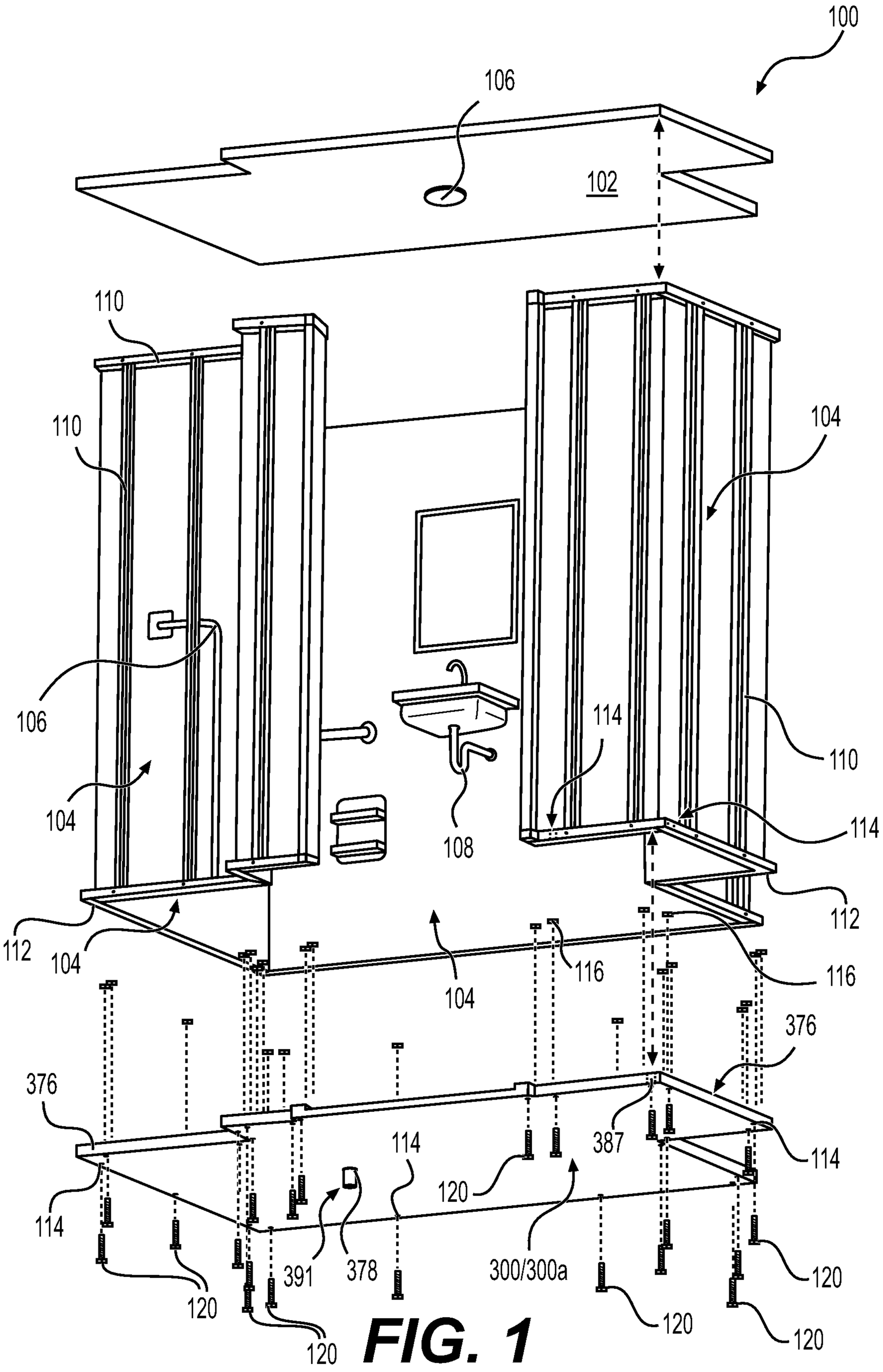
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FIG. 1

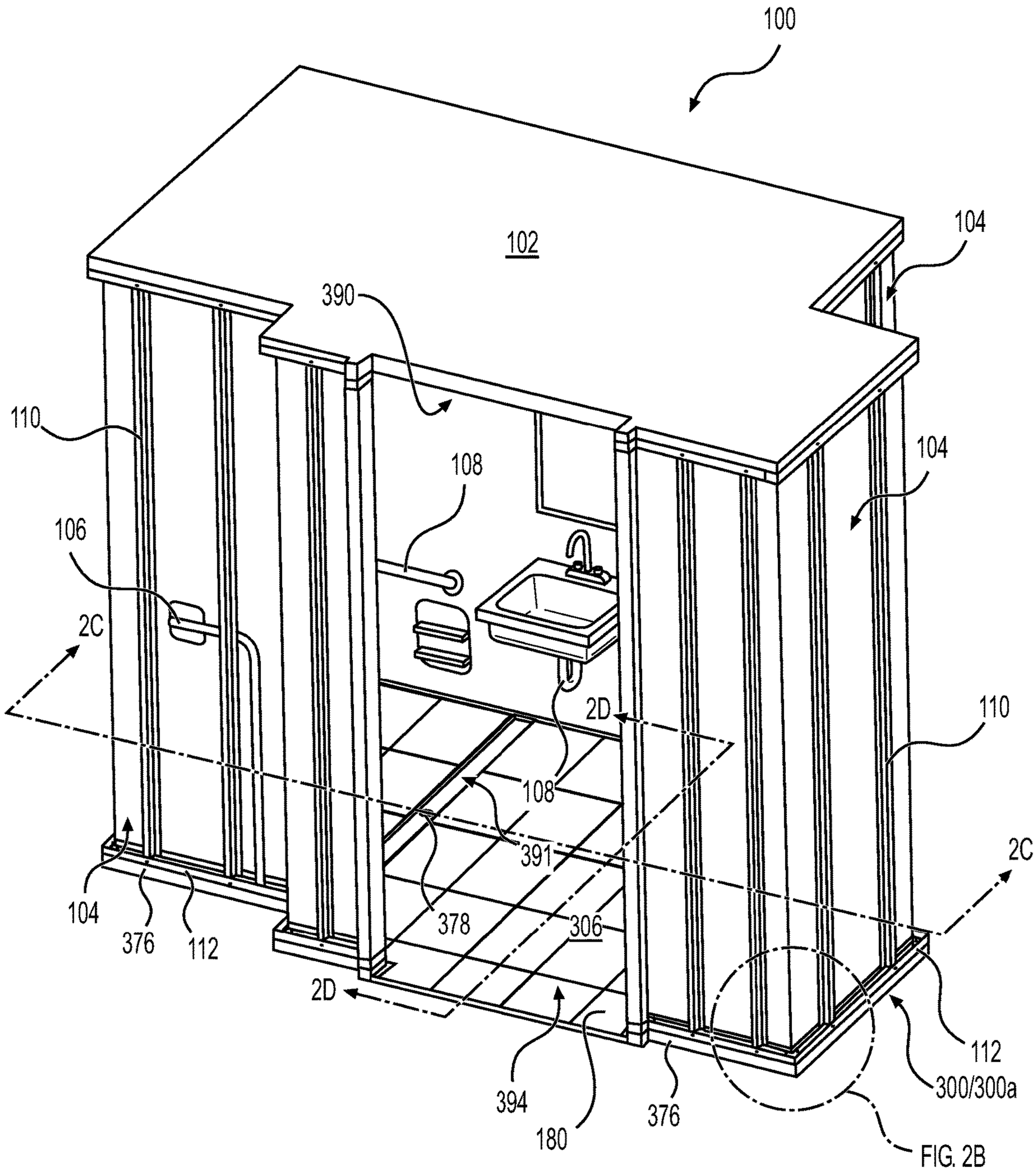
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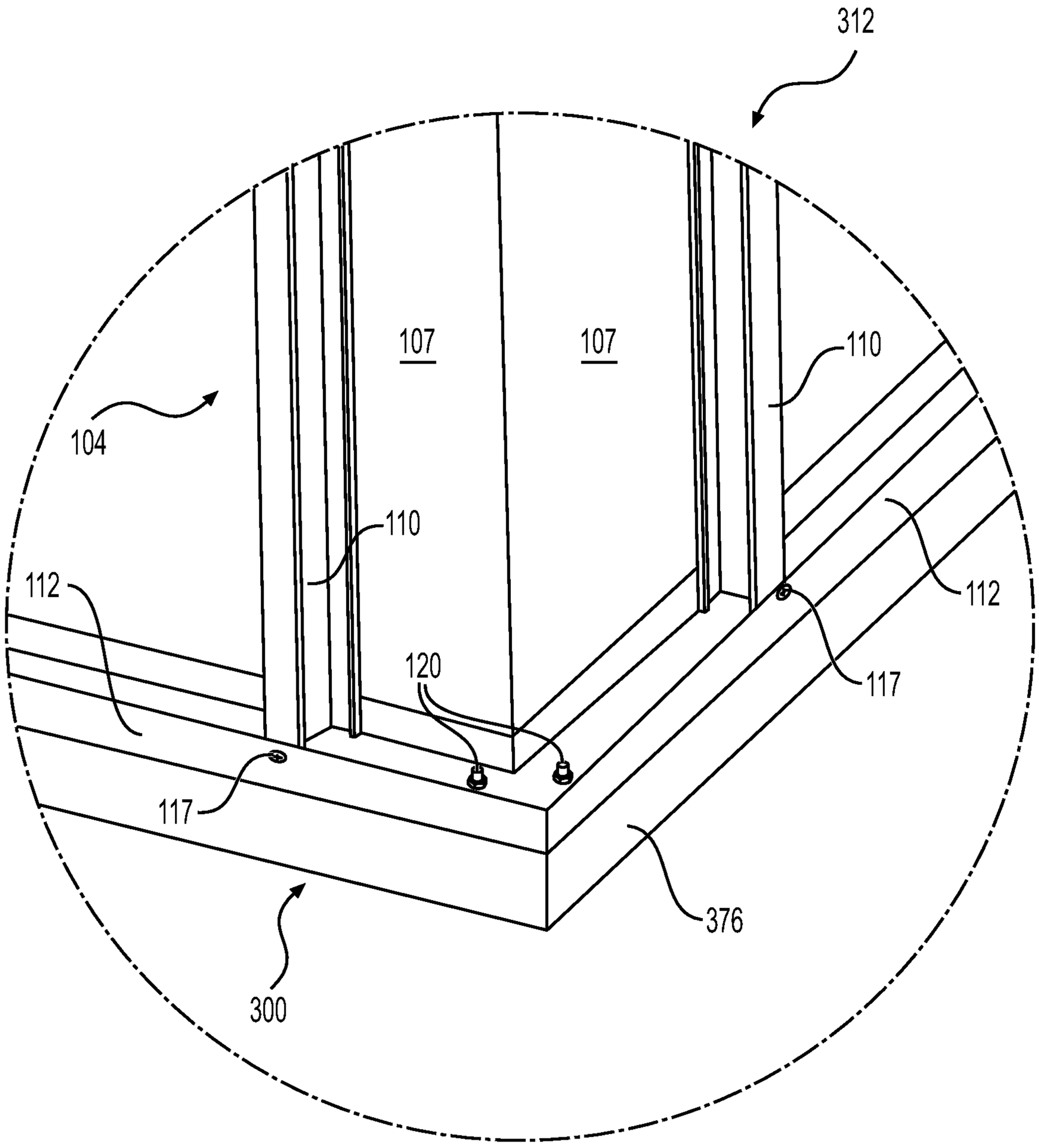
FIG. 2B

FIG. 2A



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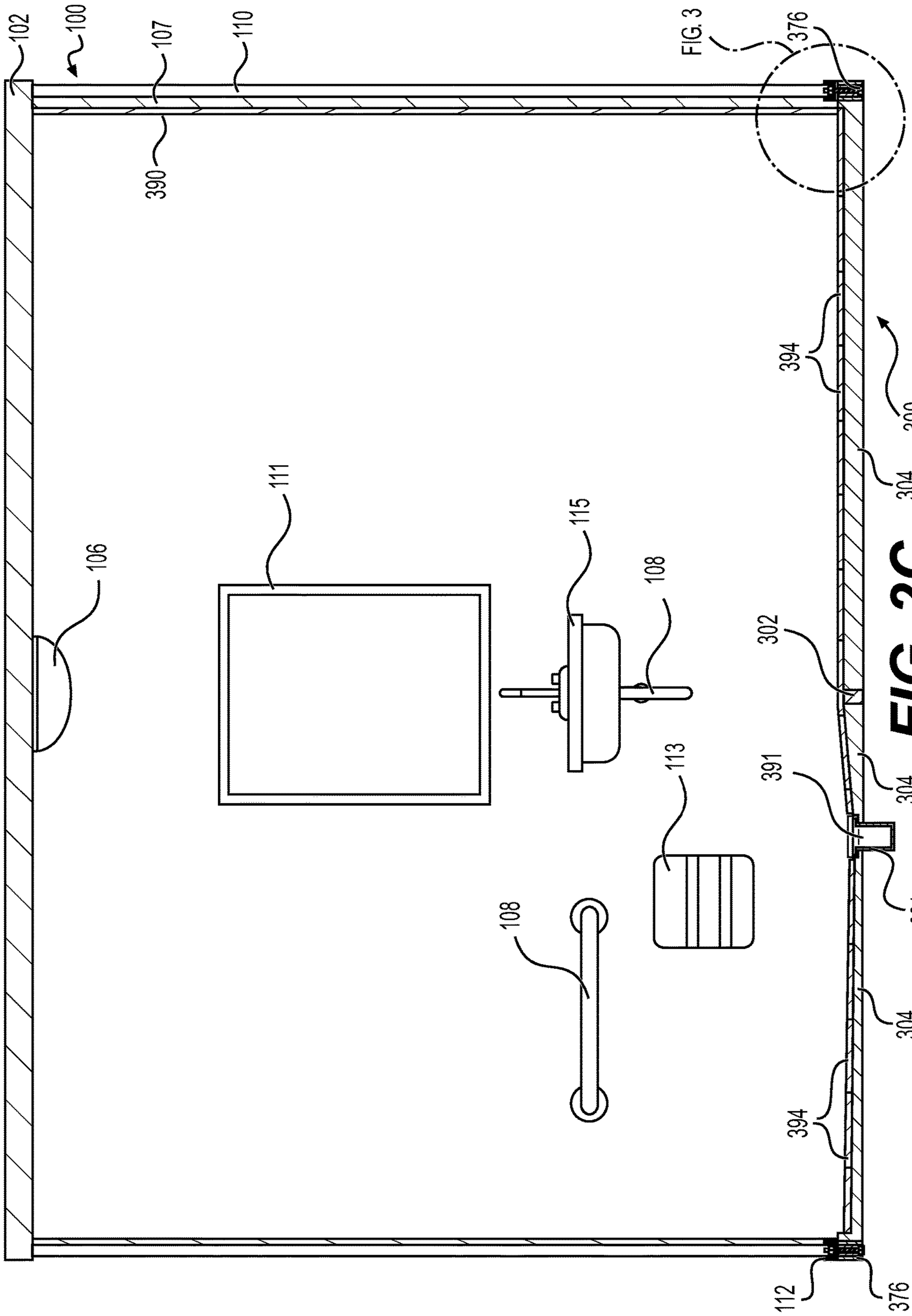
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FIG. 2C

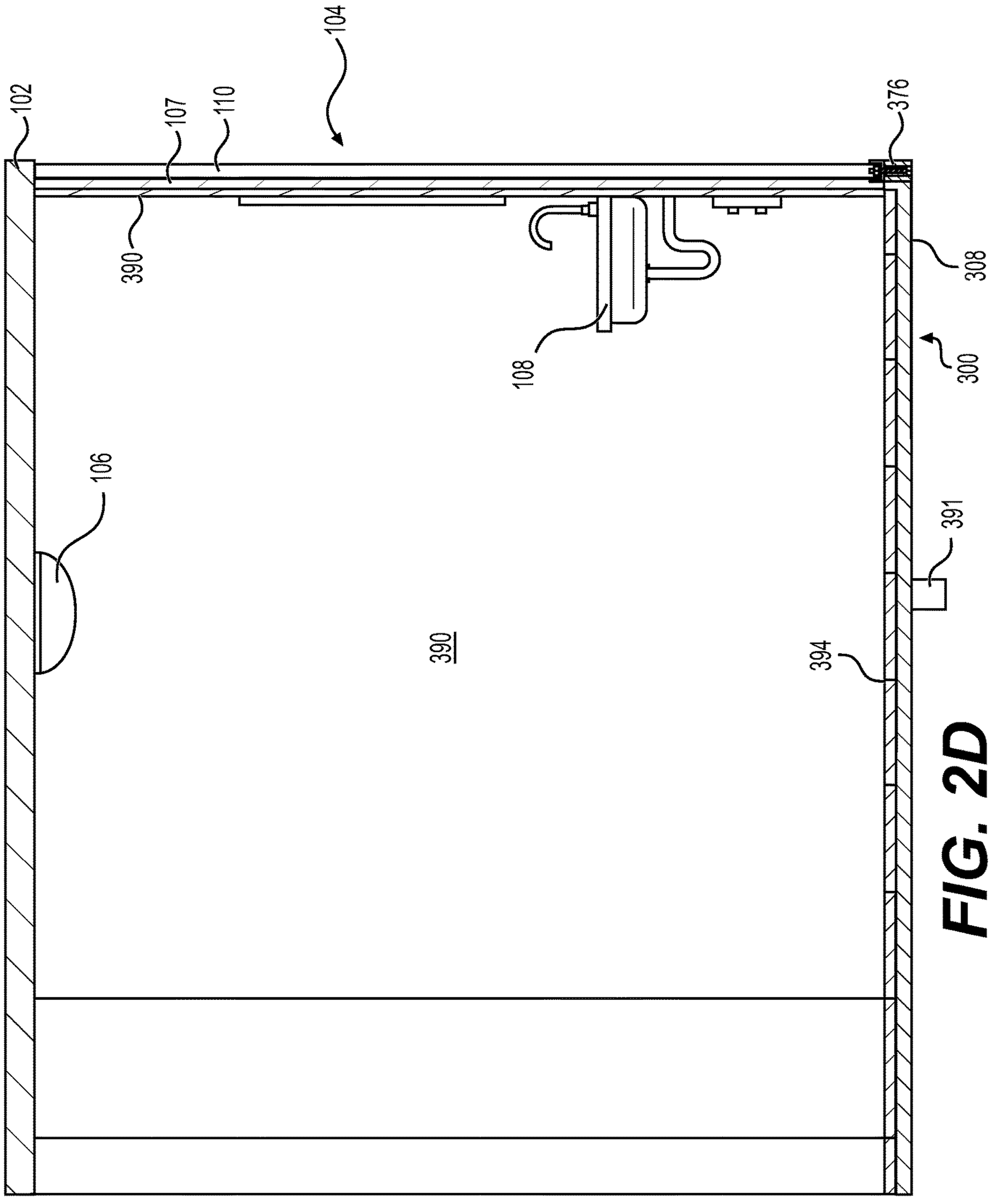


FIG. 2D

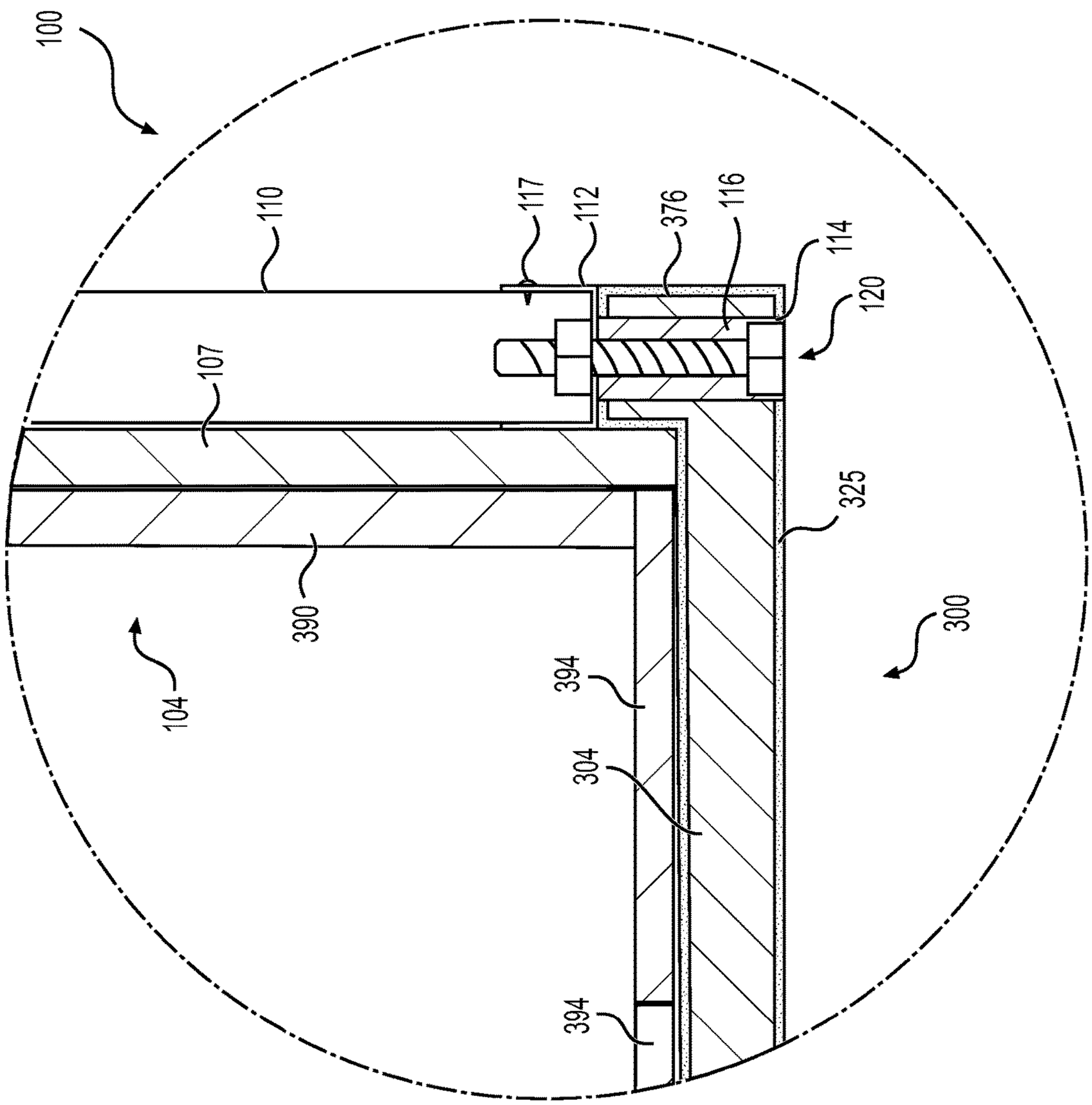
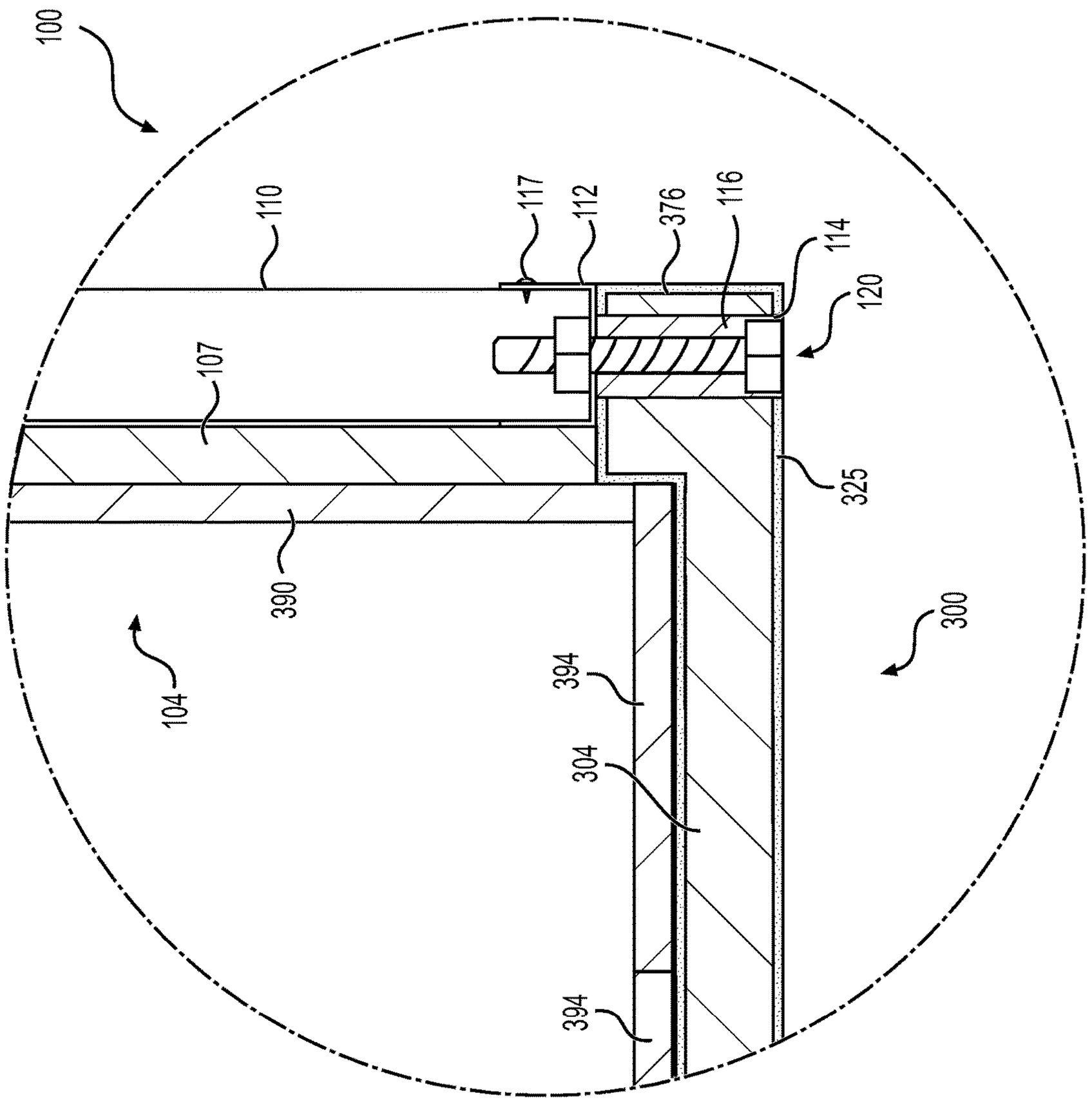


FIG. 3A



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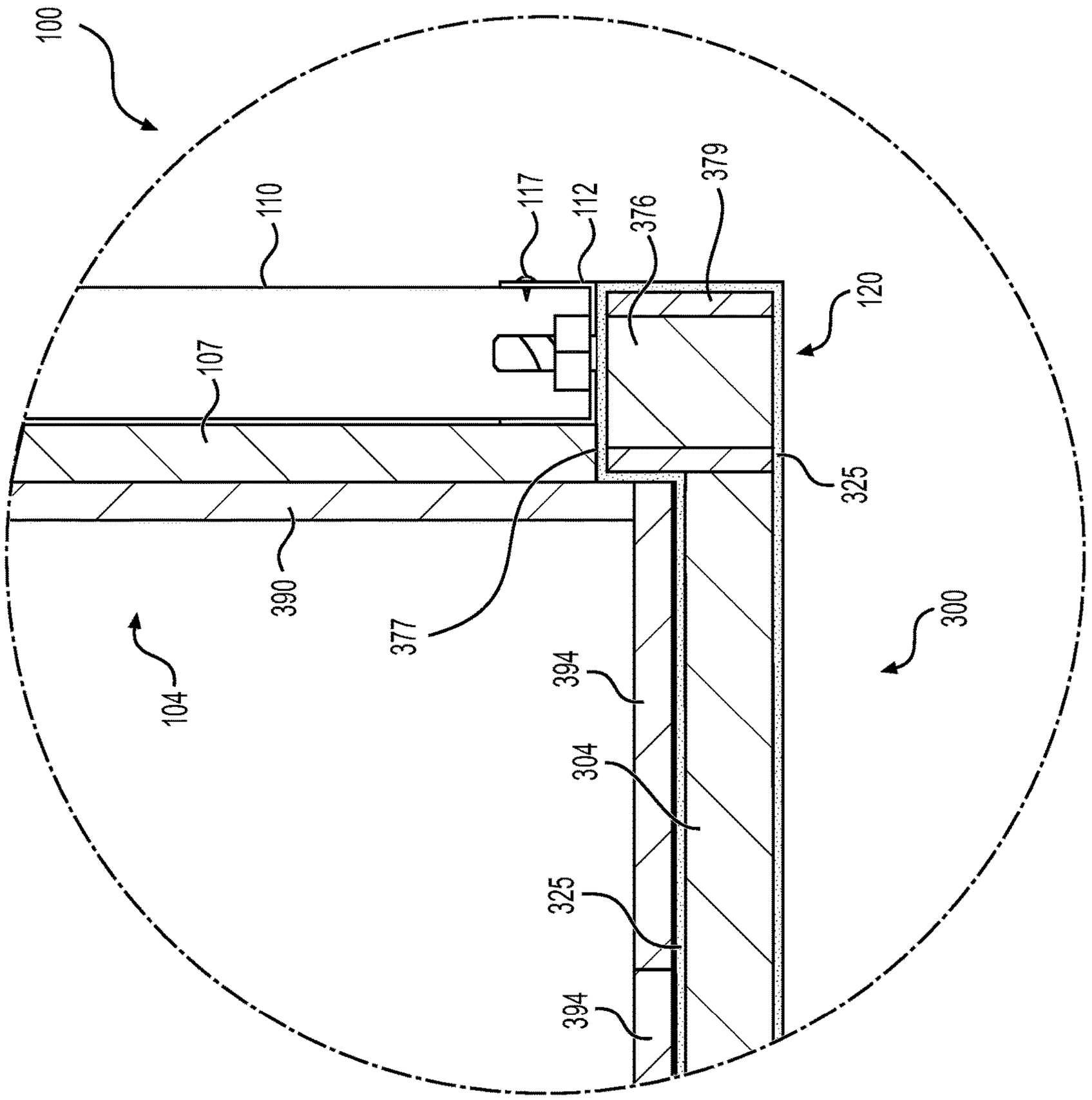
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FIG. 3C

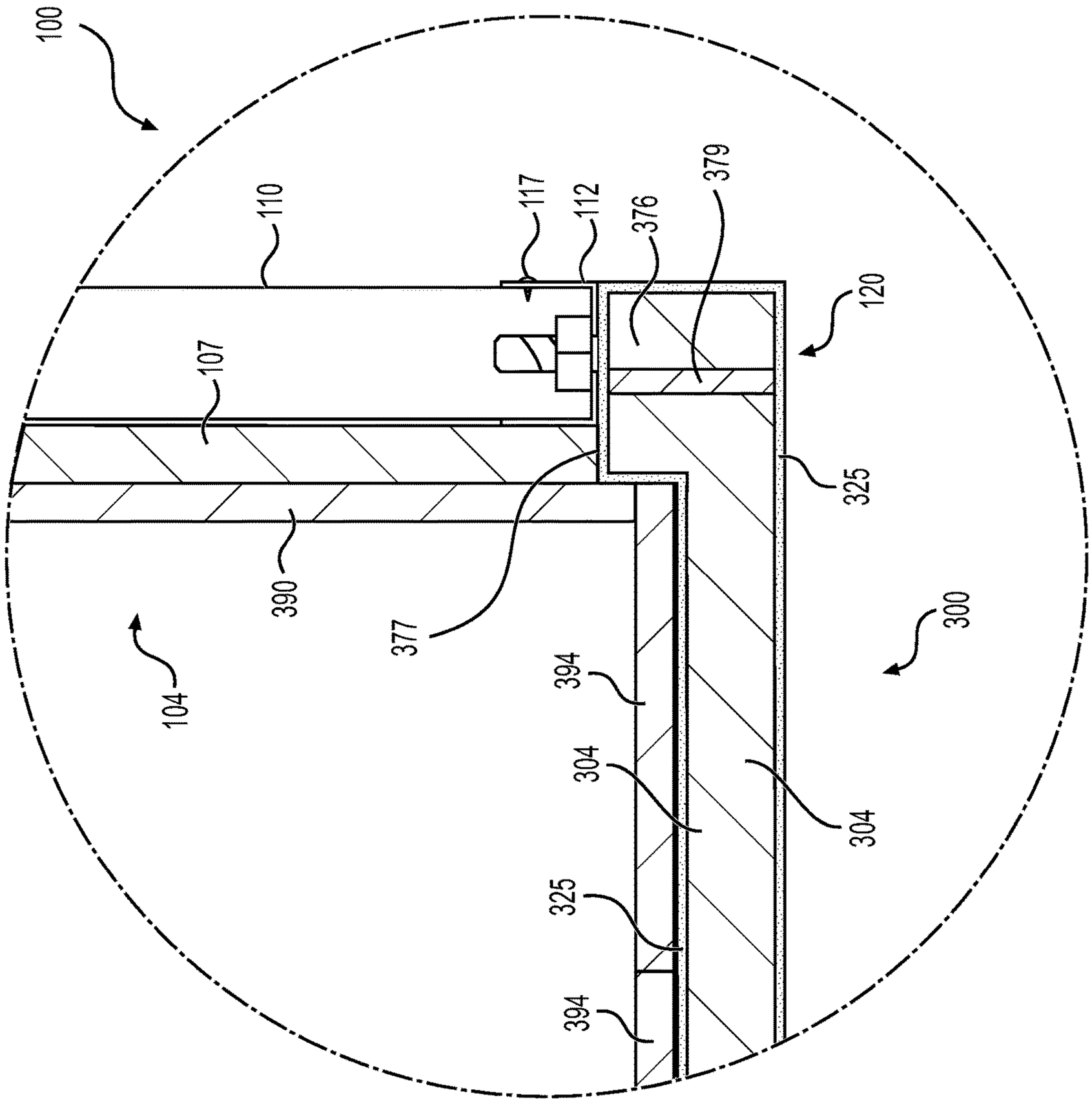
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FIG. 3D

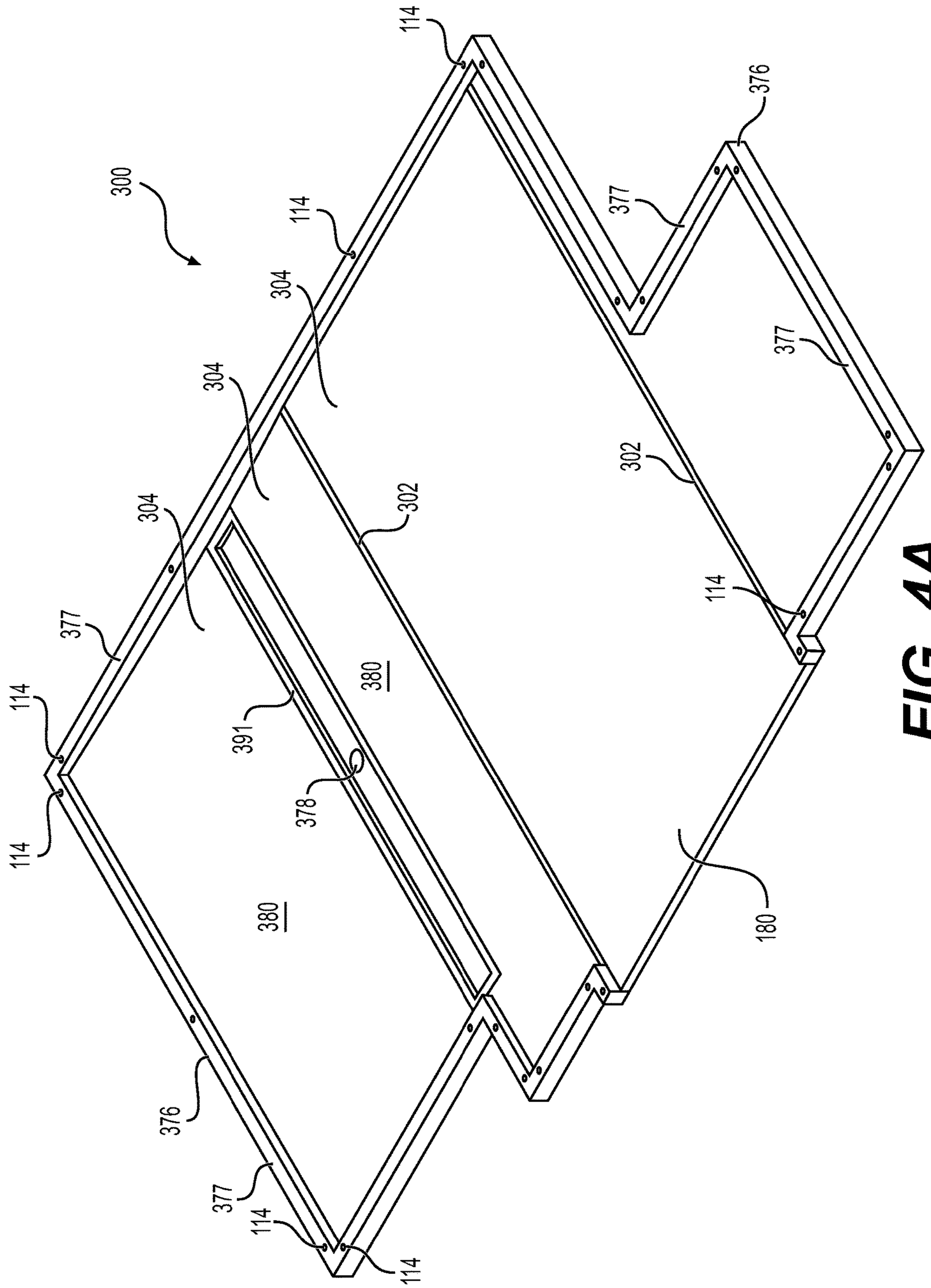
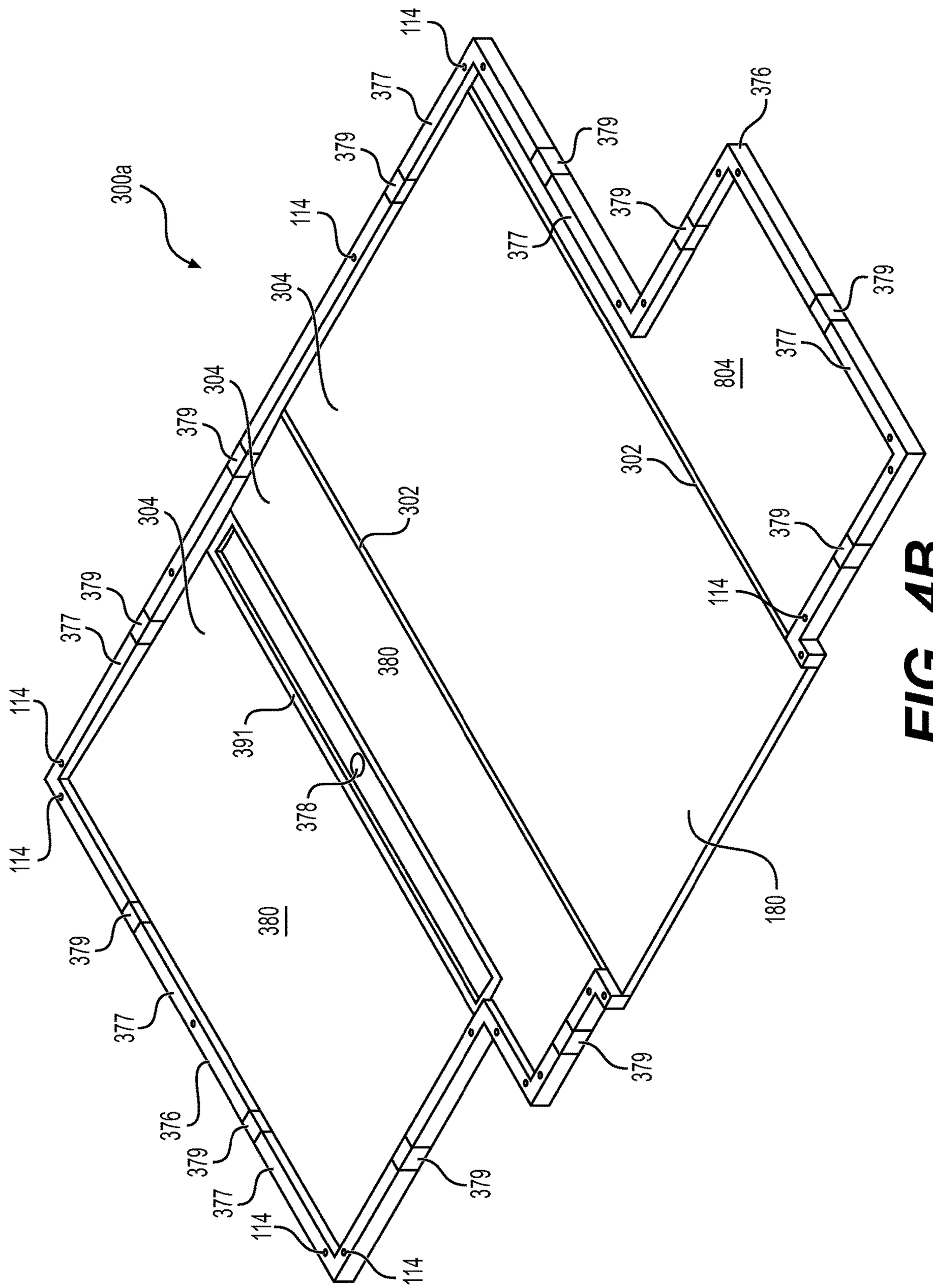


FIG. 4A



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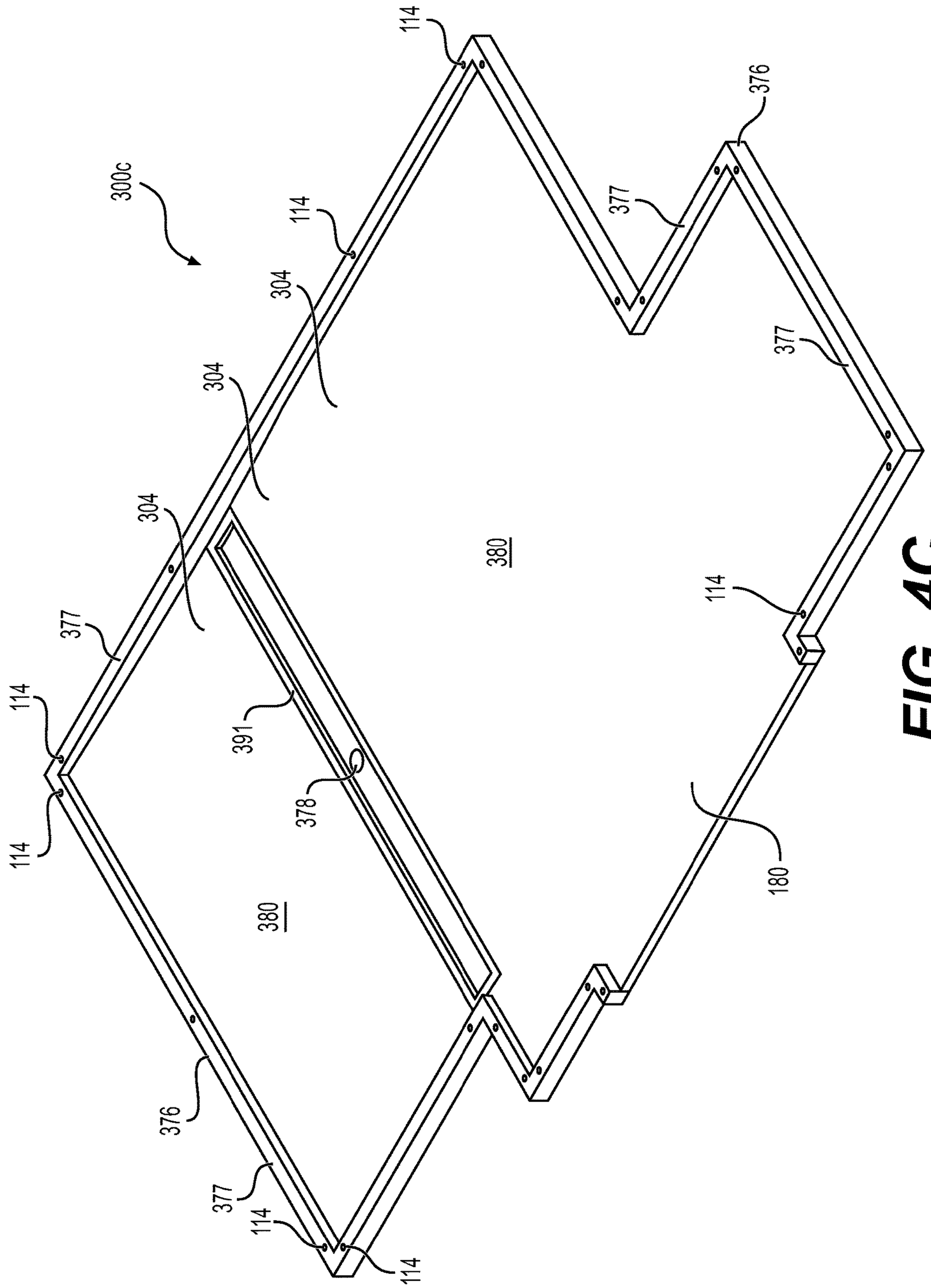

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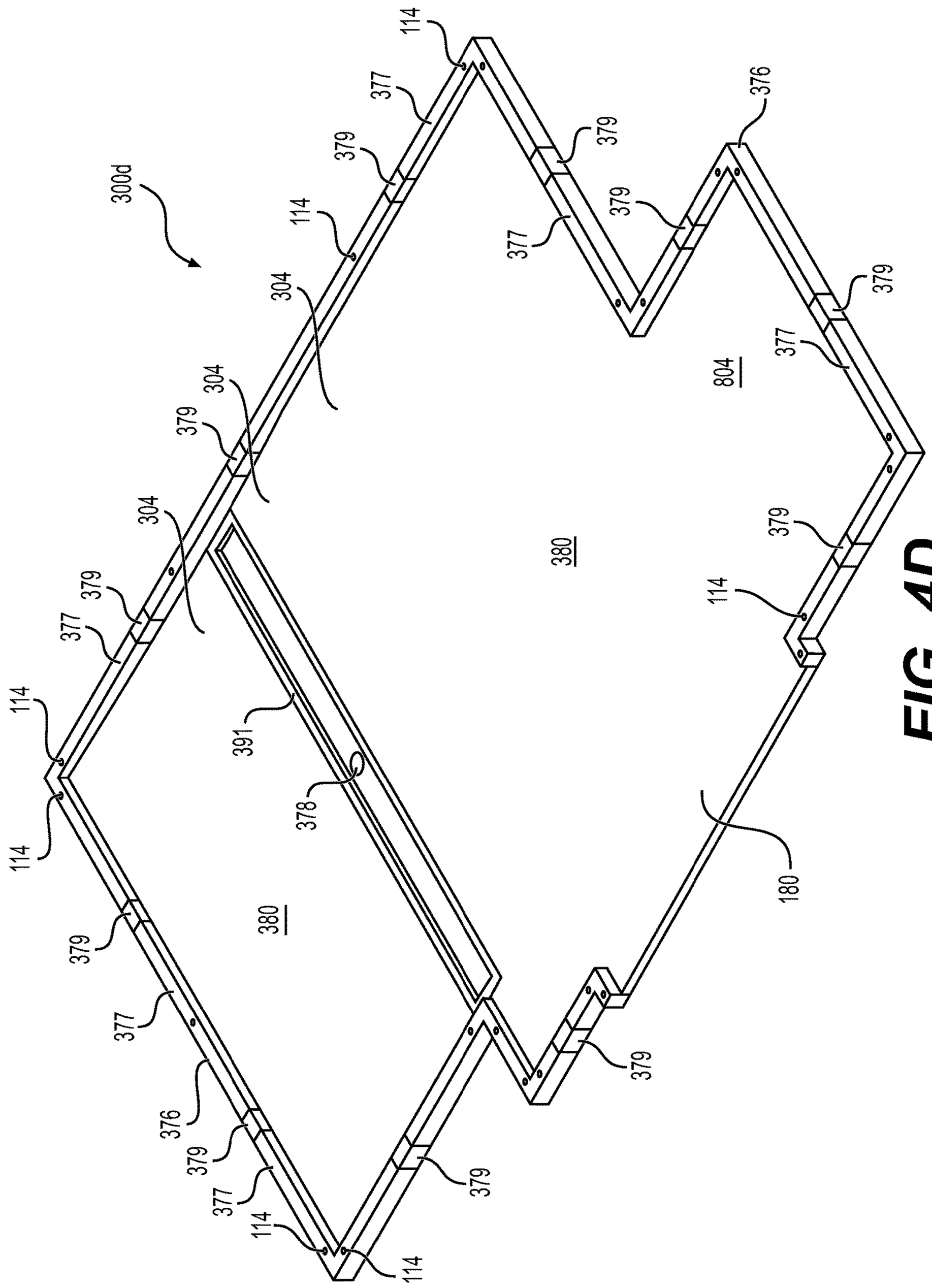

FIG. 4D

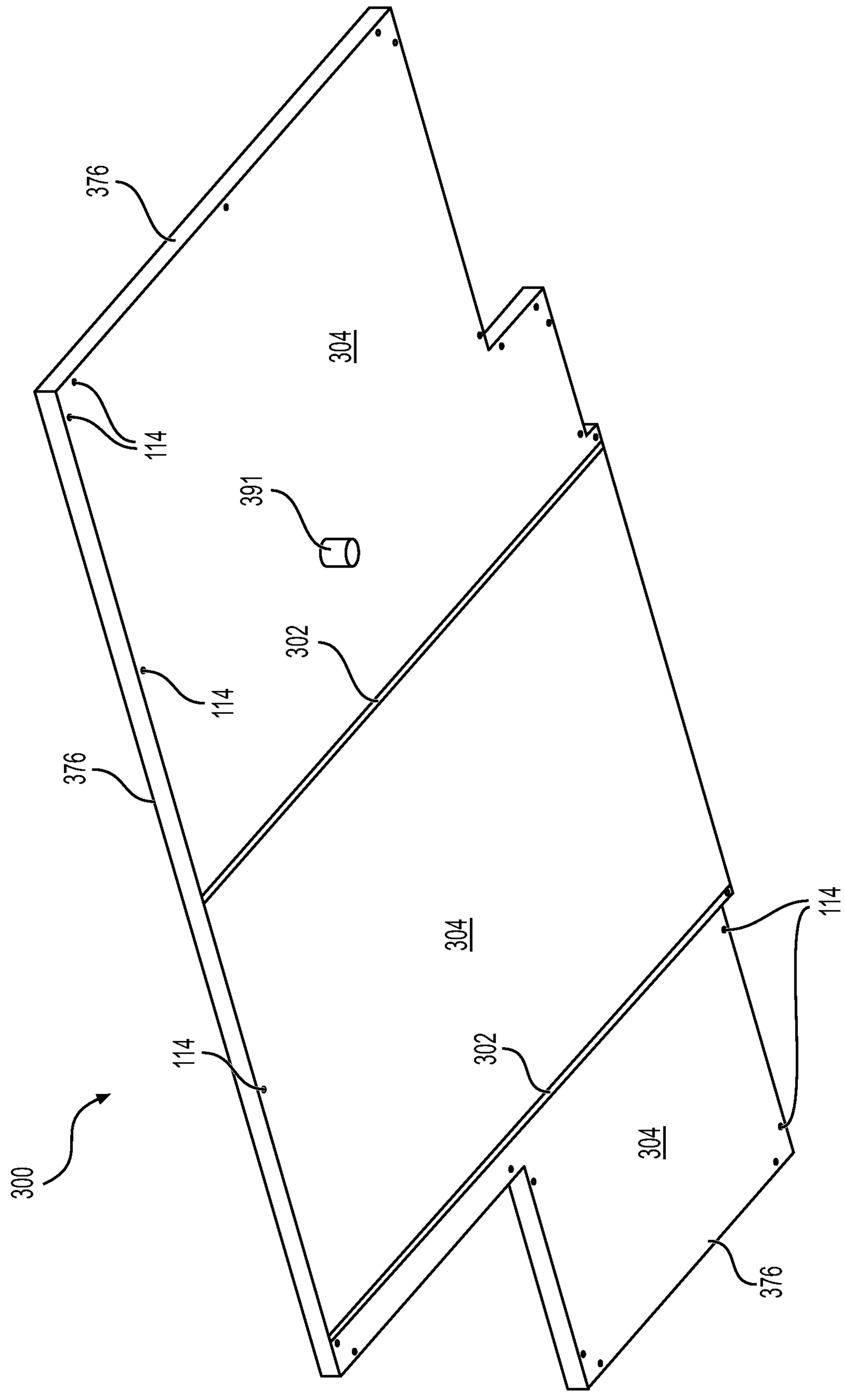

FIG. 5A

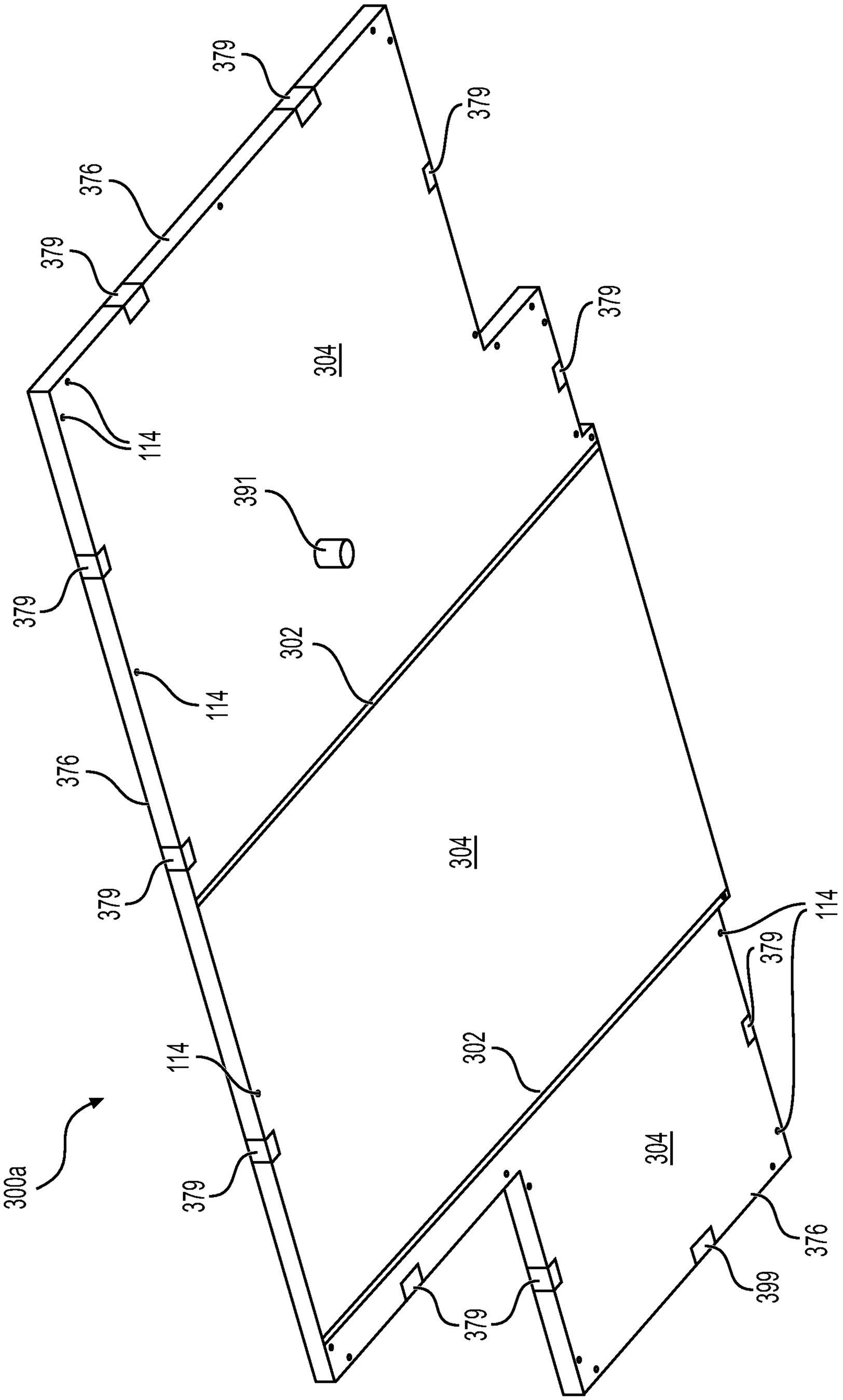
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FIG. 5B

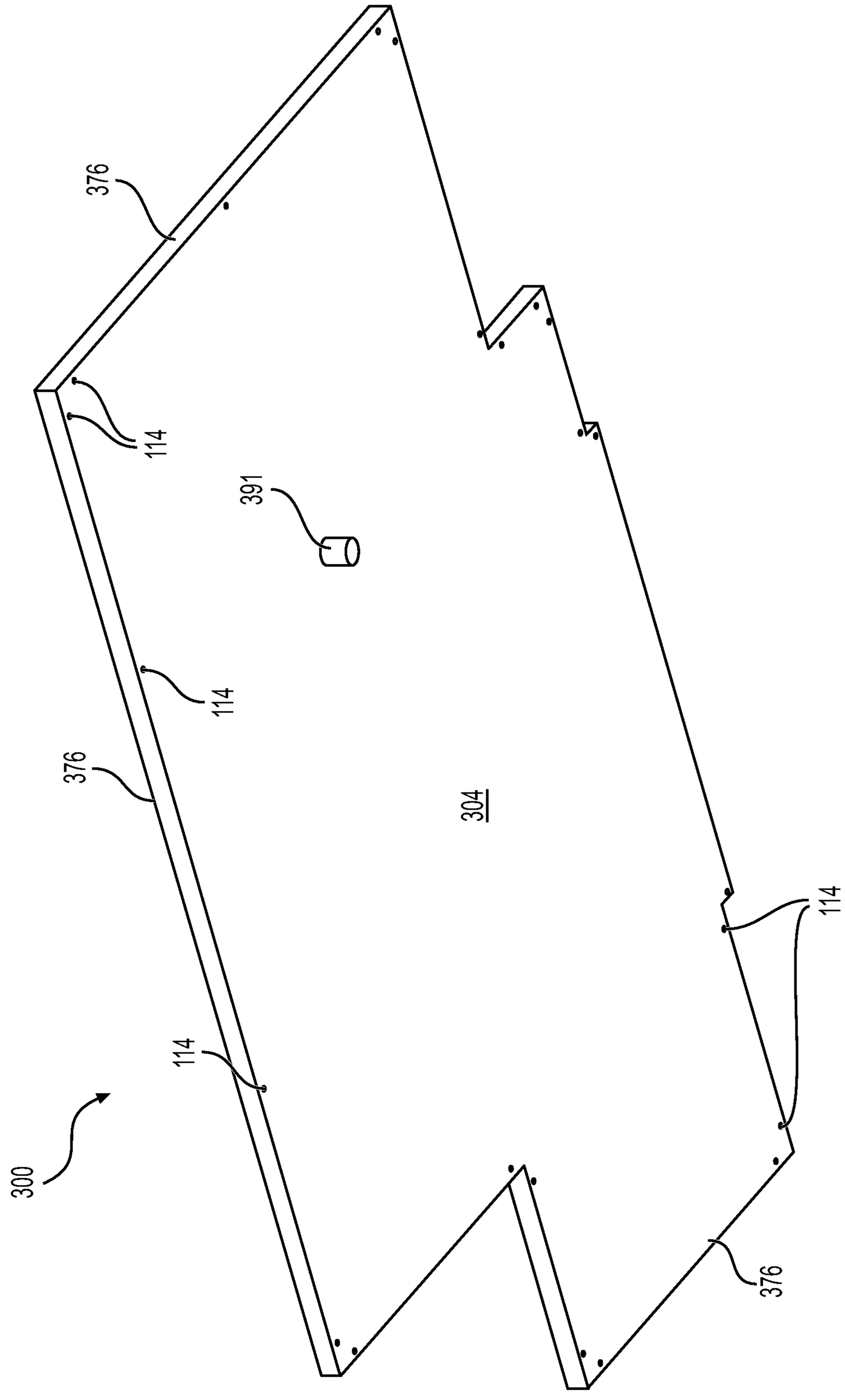

FIG. 5C

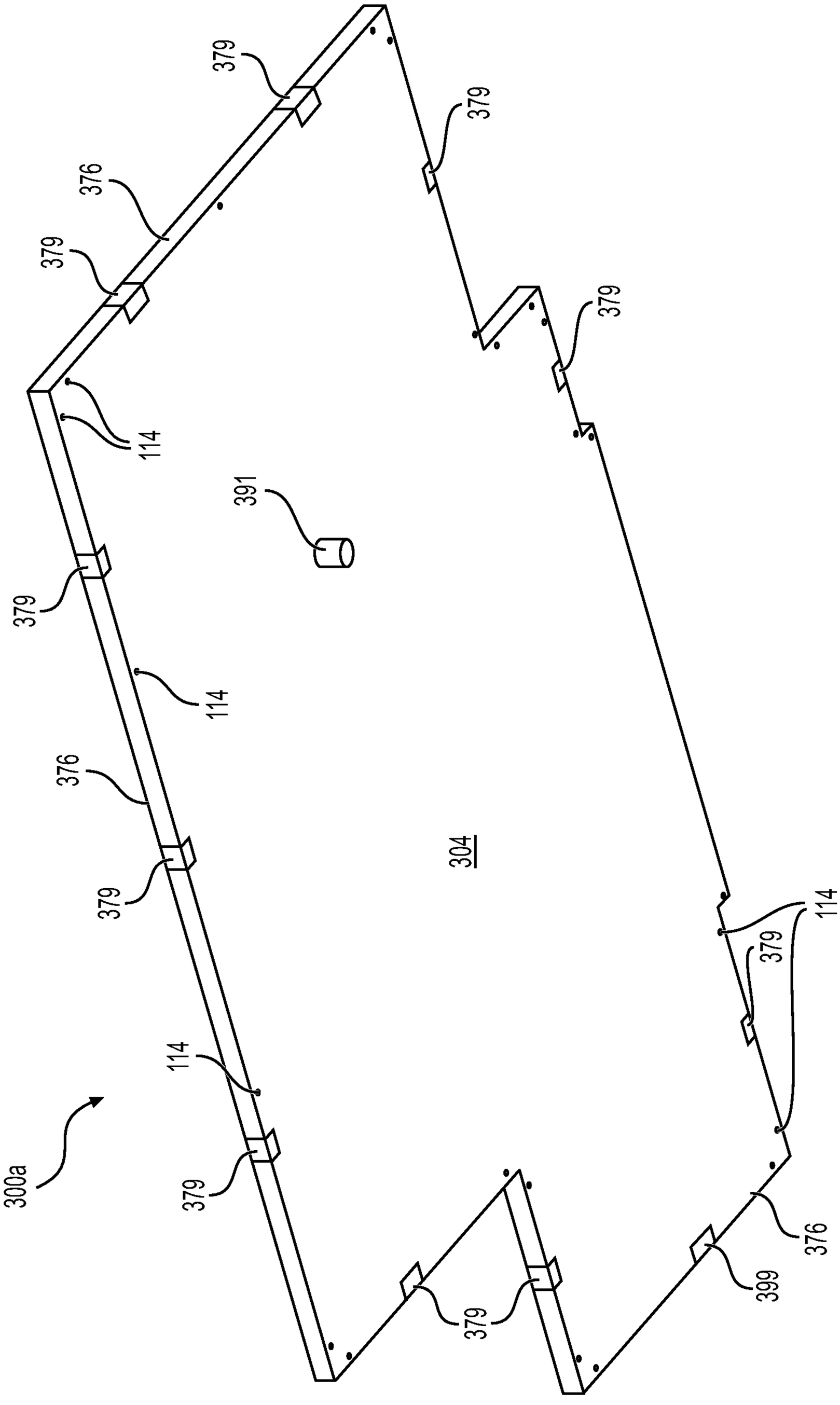
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FIG. 5D

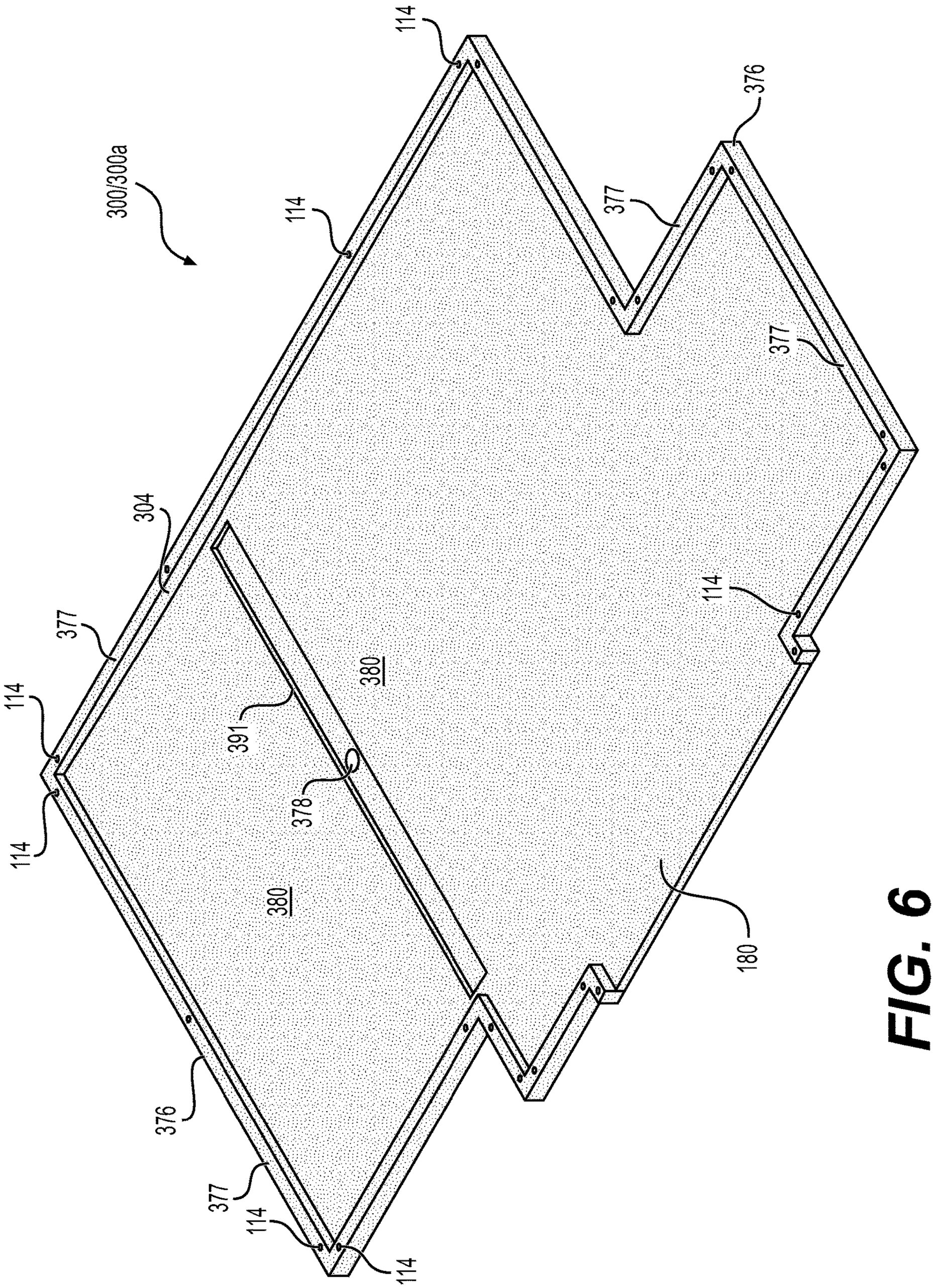
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FIG. 6

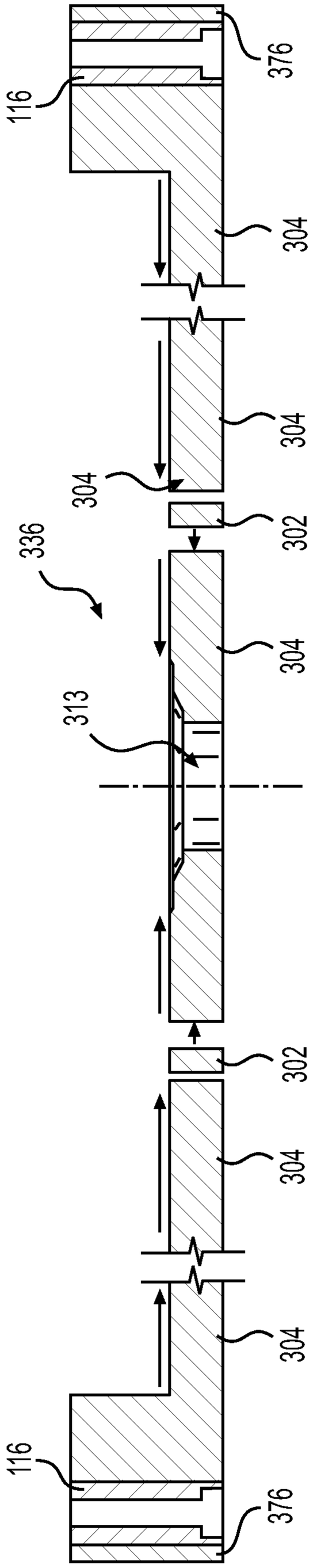
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FIG. 7A

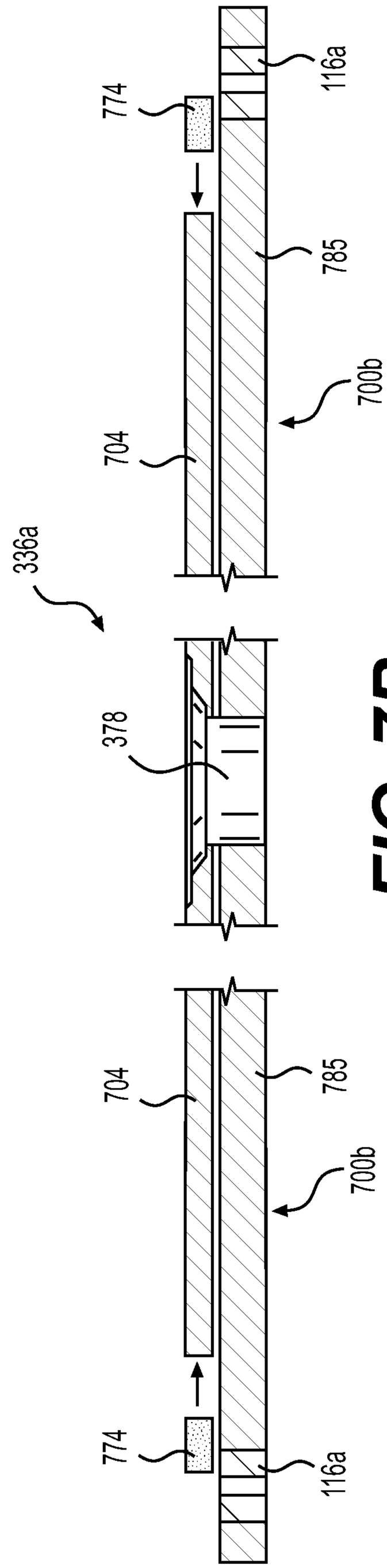

774
116a
785
700b
704
336a
378
704
785
700b
774
116a

FIG. 7B

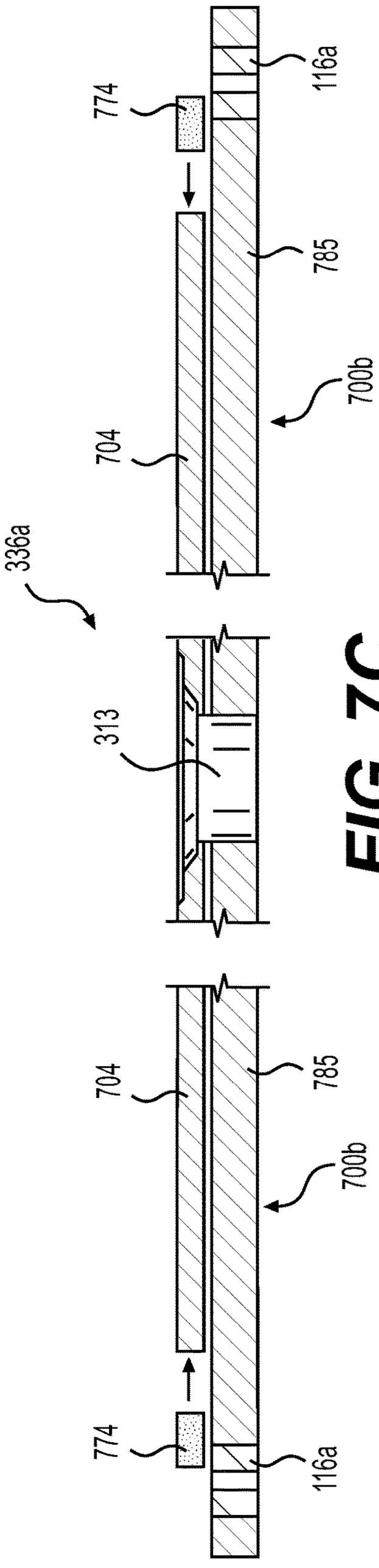

774
116a
785
704
700b
336a
313
704
785
700b
774
116a

FIG. 7C

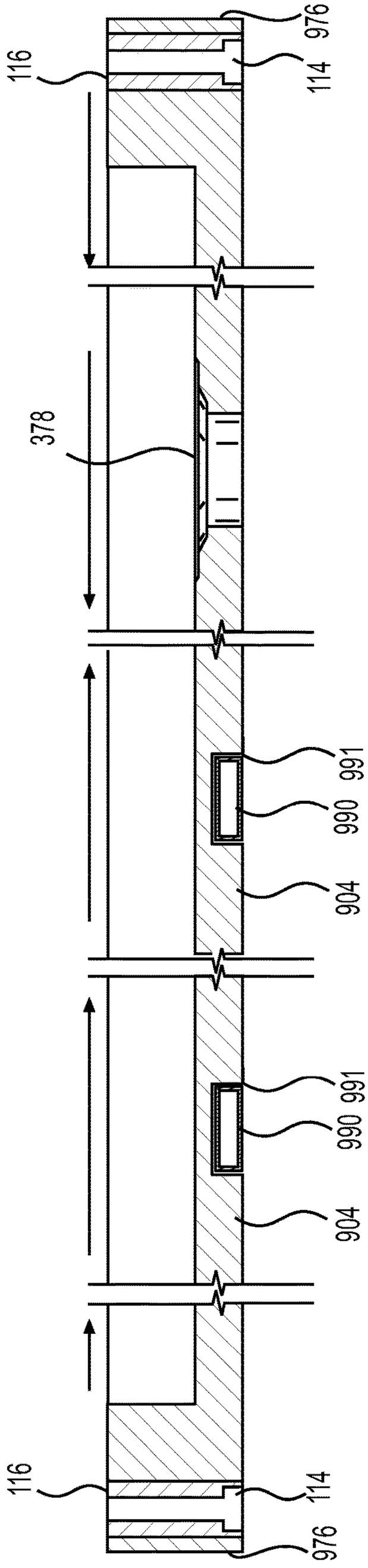

116
976
114
378
991
990
904
991
990
904
116
114
976

FIG. 7D

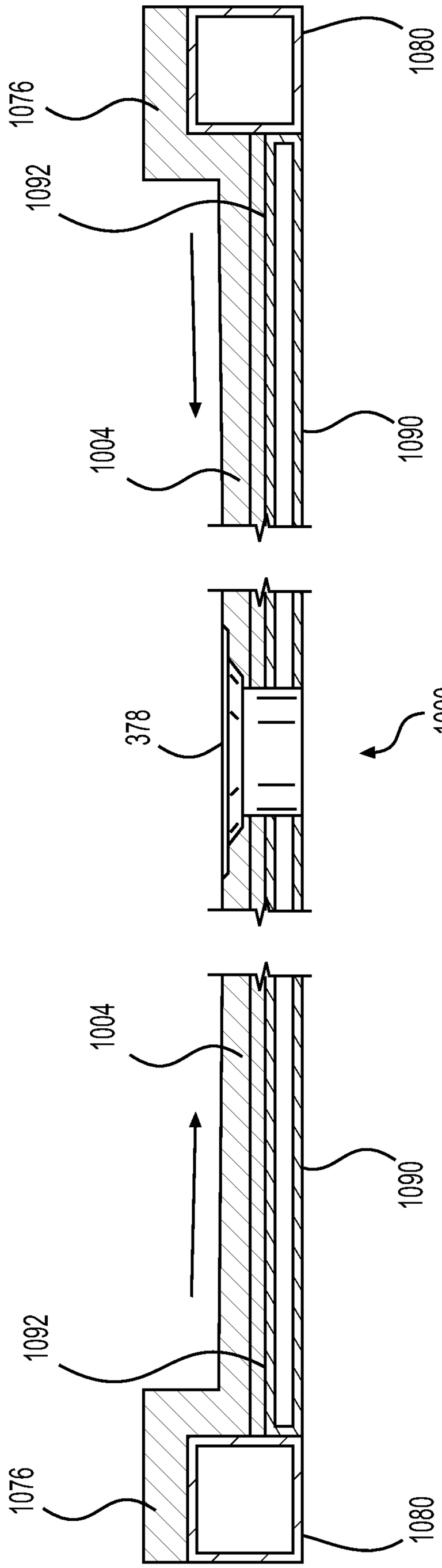


FIG. 7E

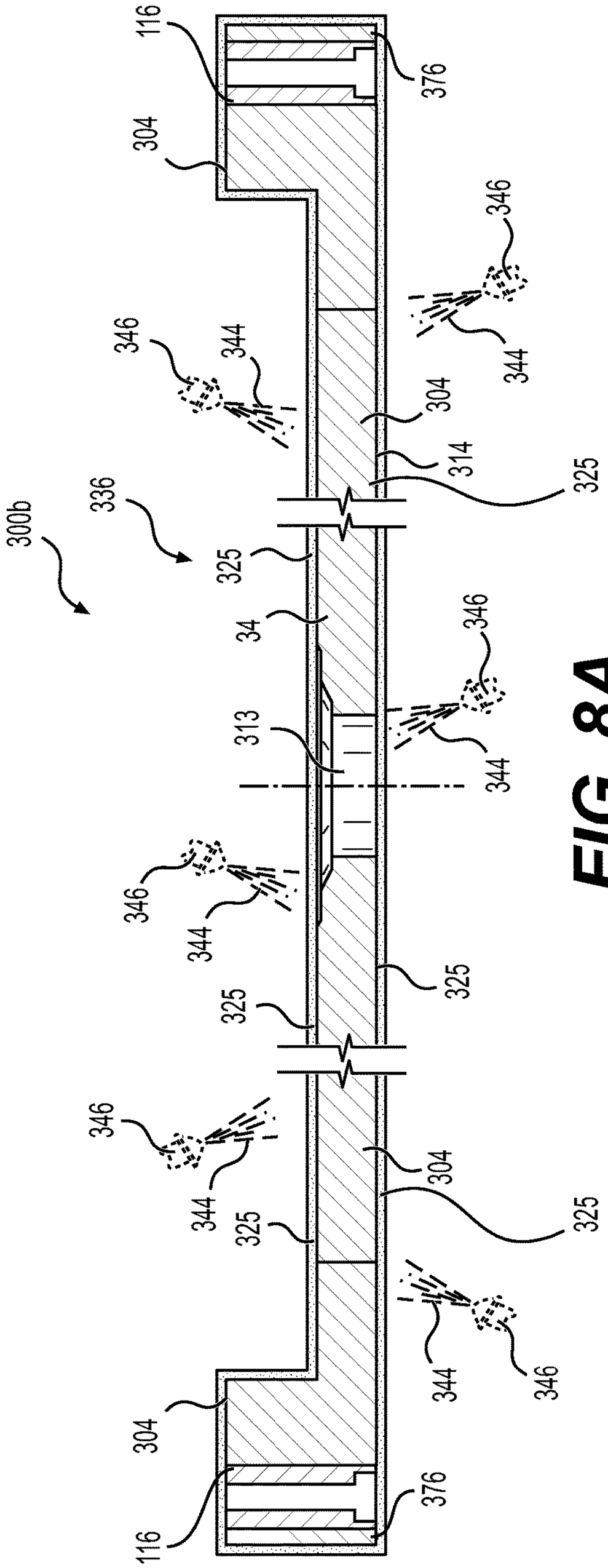

300b
336
116
304
376
346
344
325
313
34
314

FIG. 8A

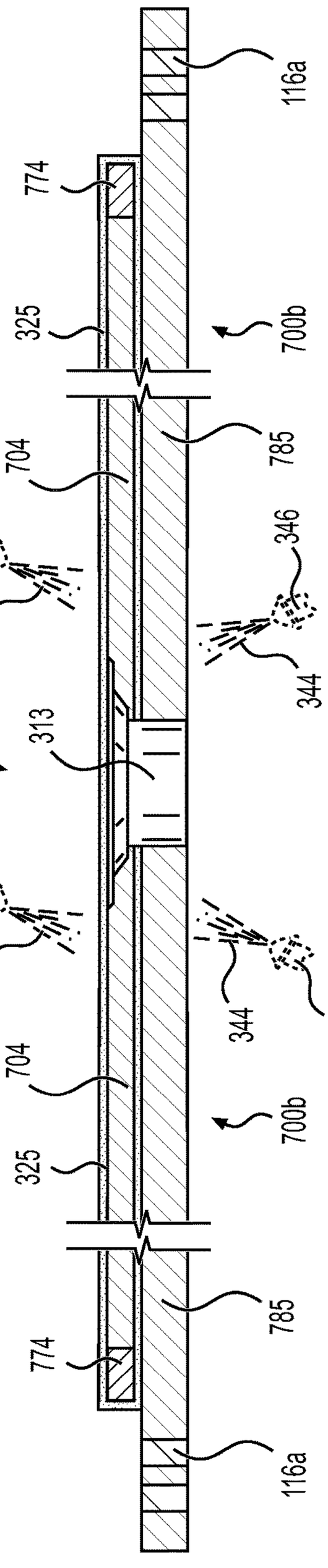

336a
116a
774
325
700b
704
785
313
346
344

FIG. 8B

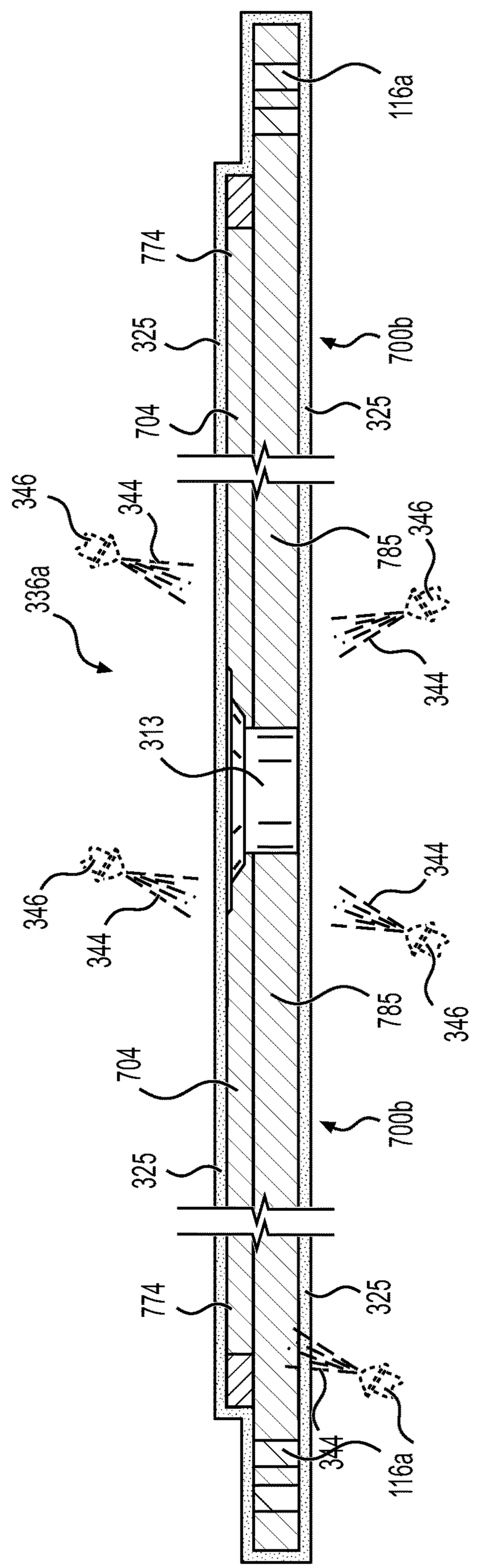

116a
774
325
700b
704
325
346
344
336a
313
785
346
344
346
344
785
346
704
325
700b
774
325
344
116a

FIG. 8C

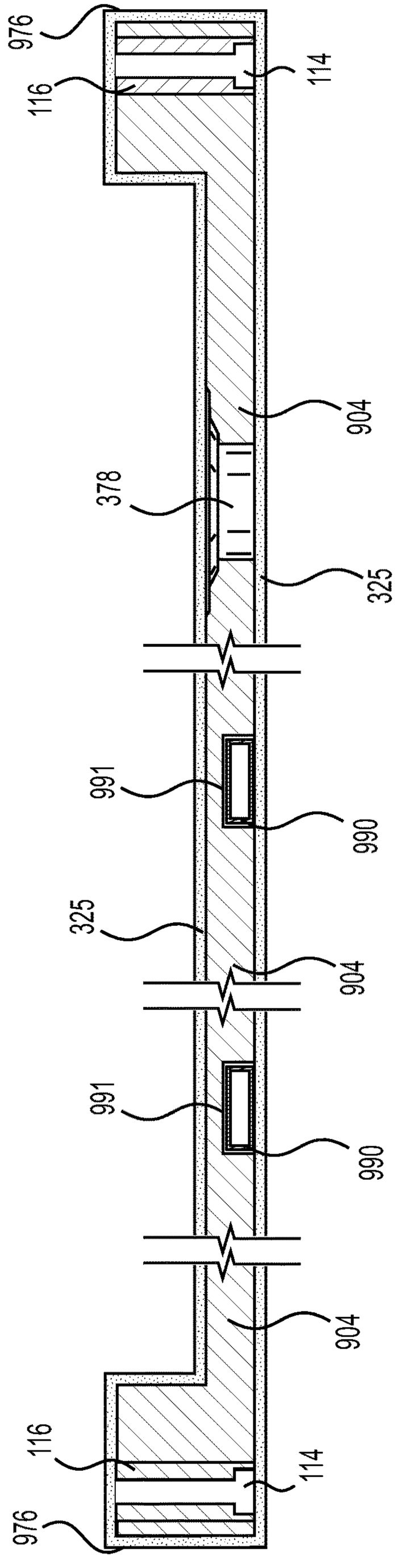

976
116
114
904
378
325
991
990
325
904
991
990
904
116
114
976

FIG. 8D

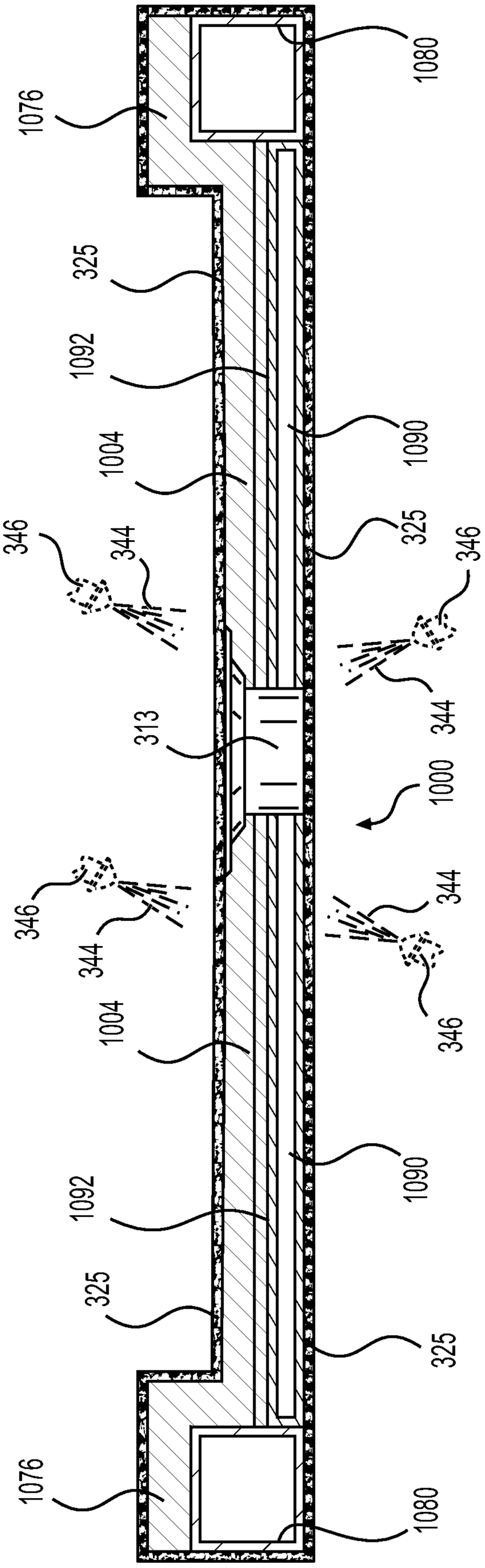

1080
1076
325
1092
1004
346
344
313
1000
1090
325
346
344
346
344
1004
346
1092
325
1090
1076
1080

FIG. 8E

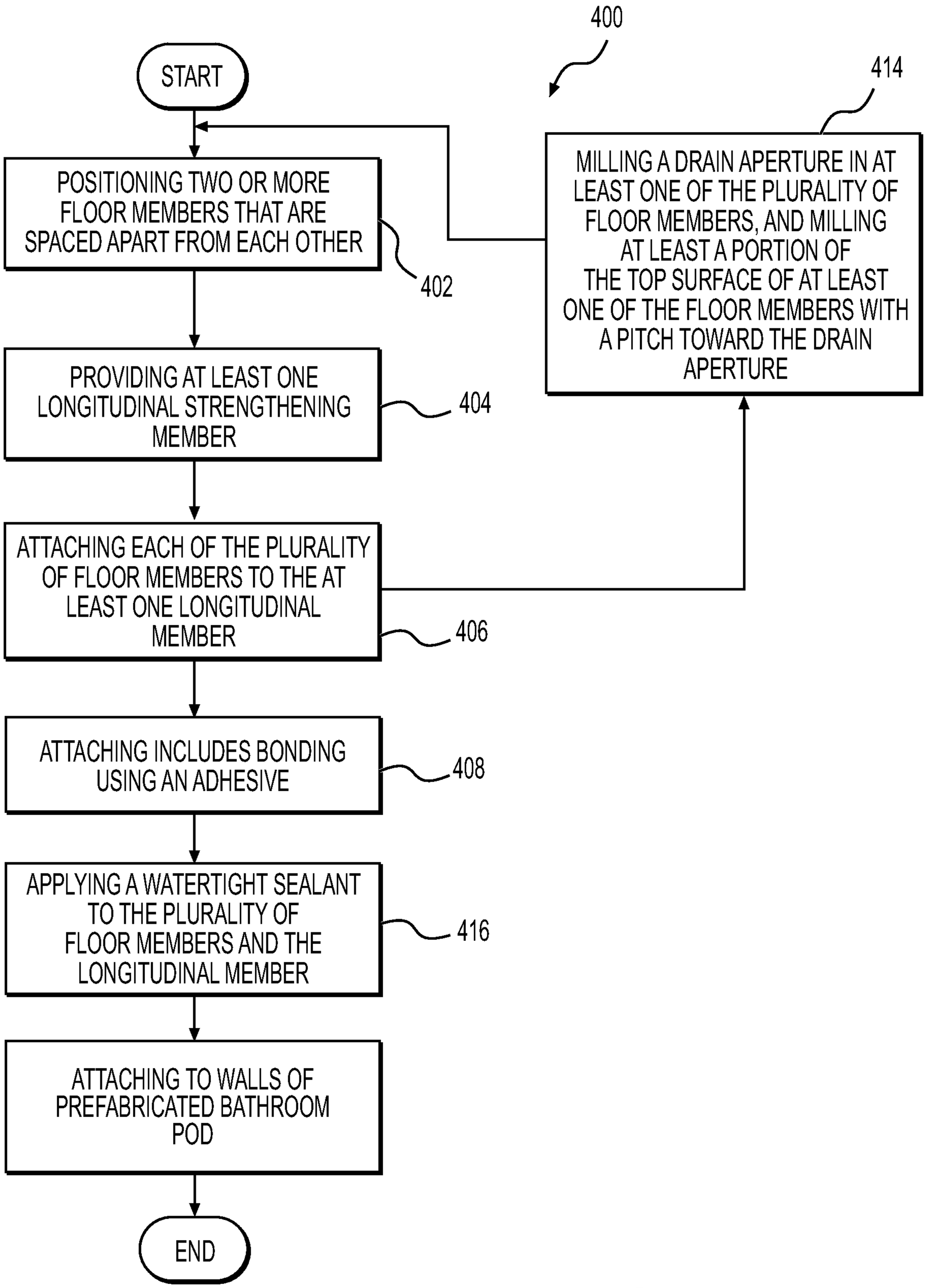

400
START
POSITIONING TWO OR MORE FLOOR MEMBERS THAT ARE SPACED APART FROM EACH OTHER
402
PROVIDING AT LEAST ONE LONGITUDINAL STRENGTHENING MEMBER
404
ATTACHING EACH OF THE PLURALITY OF FLOOR MEMBERS TO THE AT LEAST ONE LONGITUDINAL MEMBER
406
ATTACHING INCLUDES BONDING USING AN ADHESIVE
408
APPLYING A WATERTIGHT SEALANT TO THE PLURALITY OF FLOOR MEMBERS AND THE LONGITUDINAL MEMBER
416
ATTACHING TO WALLS OF PREFABRICATED BATHROOM POD
END
414
MILLING A DRAIN APERTURE IN AT LEAST ONE OF THE PLURALITY OF FLOOR MEMBERS, AND MILLING AT LEAST A PORTION OF THE TOP SURFACE OF AT LEAST ONE OF THE FLOOR MEMBERS WITH A PITCH TOWARD THE DRAIN APERTURE

FIG. 9A

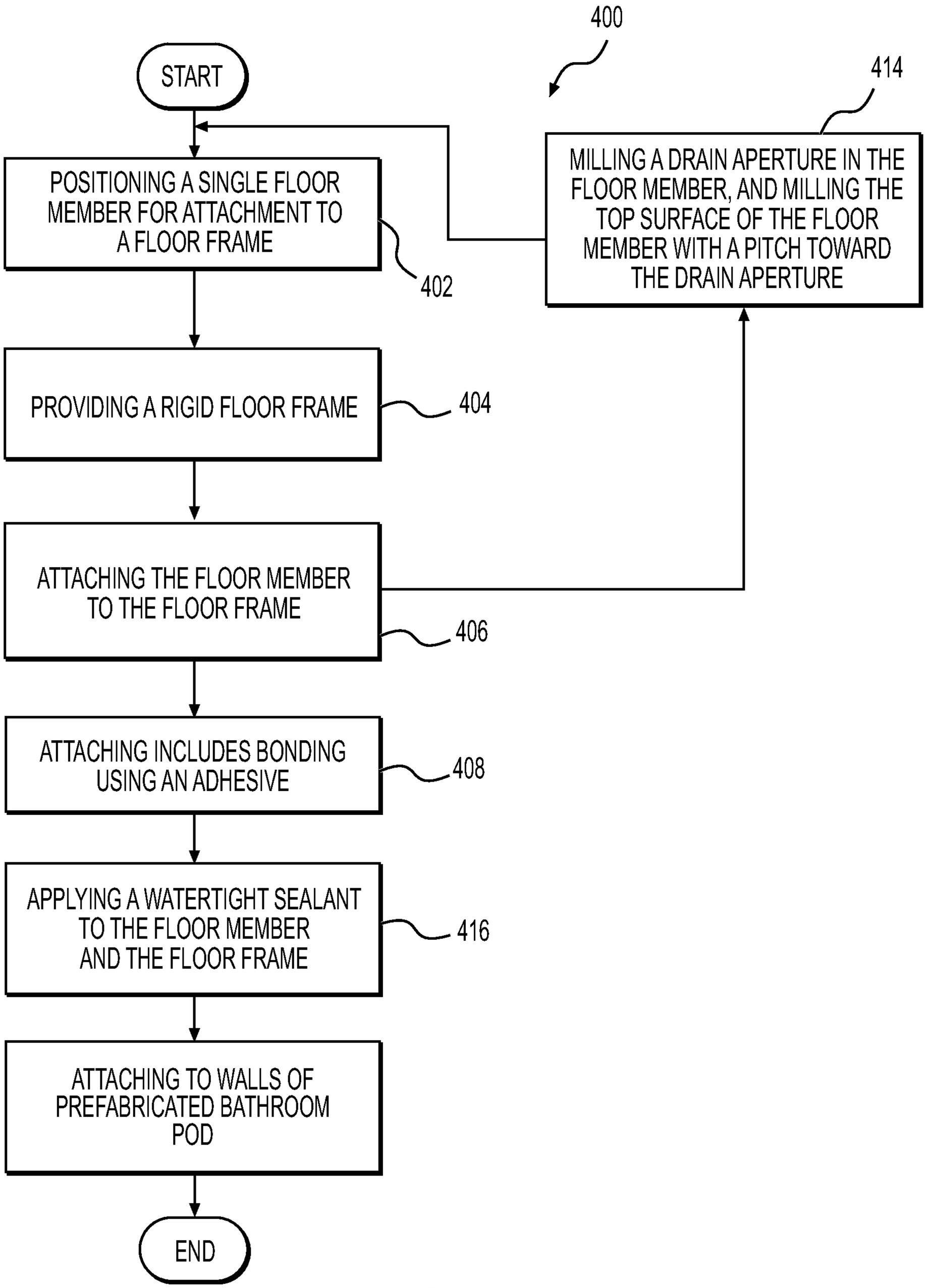

400
START
POSITIONING A SINGLE FLOOR MEMBER FOR ATTACHMENT TO A FLOOR FRAME
402
PROVIDING A RIGID FLOOR FRAME
404
ATTACHING THE FLOOR MEMBER TO THE FLOOR FRAME
406
ATTACHING INCLUDES BONDING USING AN ADHESIVE
408
APPLYING A WATERTIGHT SEALANT TO THE FLOOR MEMBER AND THE FLOOR FRAME
416
ATTACHING TO WALLS OF PREFABRICATED BATHROOM POD
END
414
MILLING A DRAIN APERTURE IN THE FLOOR MEMBER, AND MILLING THE TOP SURFACE OF THE FLOOR MEMBER WITH A PITCH TOWARD THE DRAIN APERTURE

FIG. 9B

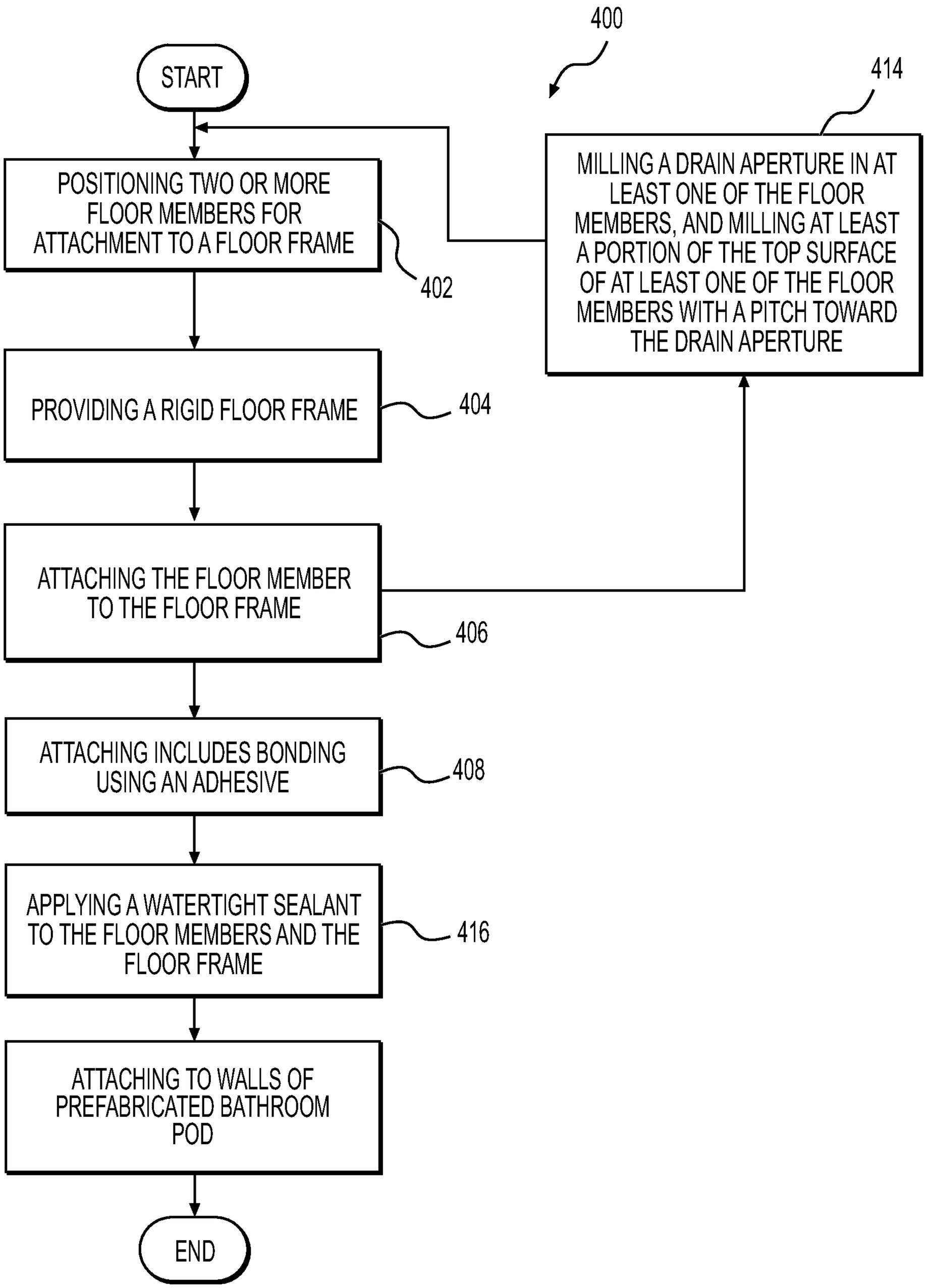

400
START
POSITIONING TWO OR MORE FLOOR MEMBERS FOR ATTACHMENT TO A FLOOR FRAME
402
PROVIDING A RIGID FLOOR FRAME
404
ATTACHING THE FLOOR MEMBER TO THE FLOOR FRAME
406
ATTACHING INCLUDES BONDING USING AN ADHESIVE
408
APPLYING A WATERTIGHT SEALANT TO THE FLOOR MEMBERS AND THE FLOOR FRAME
416
ATTACHING TO WALLS OF PREFABRICATED BATHROOM POD
END
414
MILLING A DRAIN APERTURE IN AT LEAST ONE OF THE FLOOR MEMBERS, AND MILLING AT LEAST A PORTION OF THE TOP SURFACE OF AT LEAST ONE OF THE FLOOR MEMBERS WITH A PITCH TOWARD THE DRAIN APERTURE

FIG. 9C

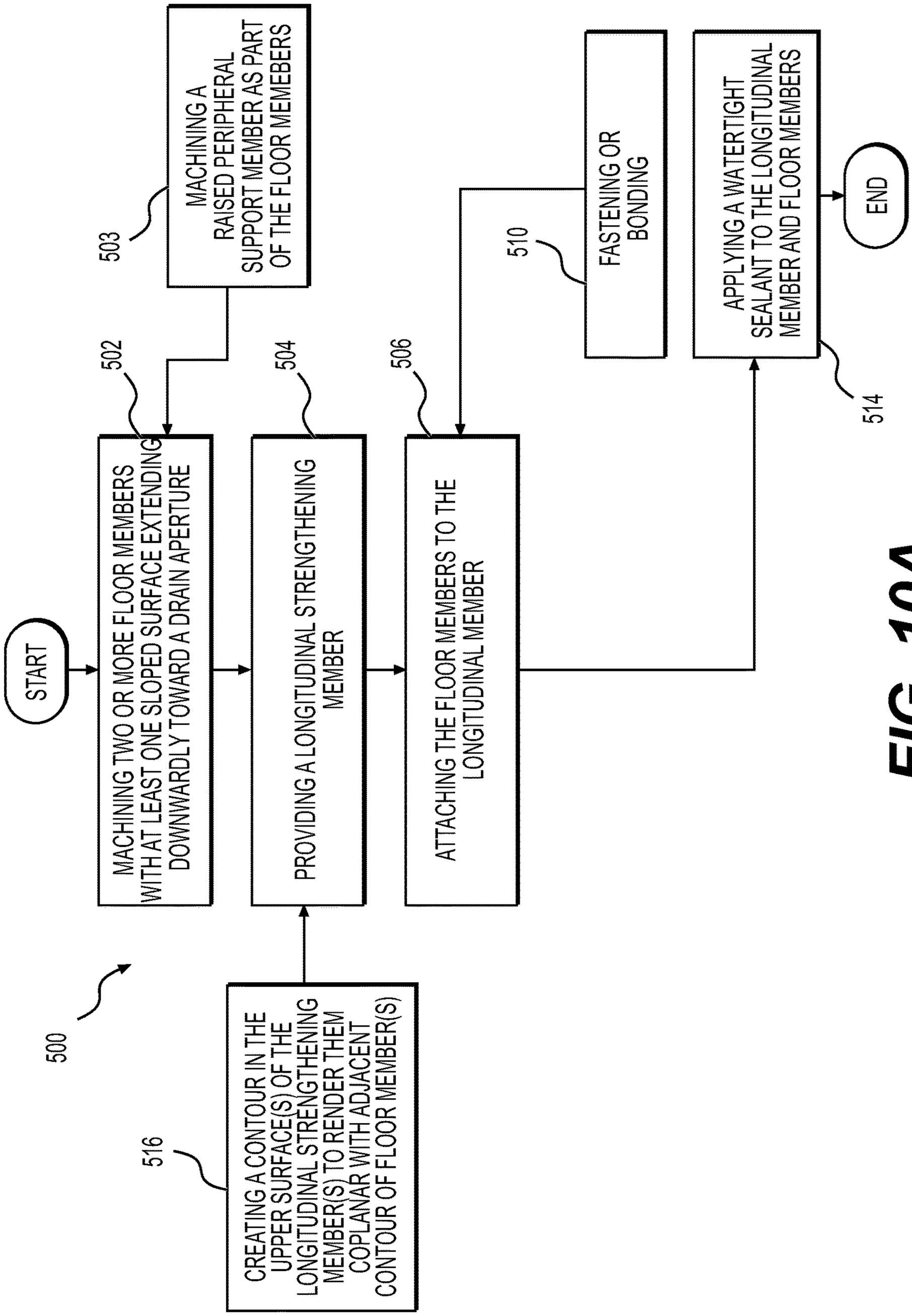

START
500
MACHINING TWO OR MORE FLOOR MEMBERS WITH AT LEAST ONE SLOPED SURFACE EXTENDING DOWNWARDLY TOWARD A DRAIN APERTURE
502
MACHINING A RAISED PERIPHERAL SUPPORT MEMBER AS PART OF THE FLOOR MEMEBERS
503
PROVIDING A LONGITUDINAL STRENGTHENING MEMBER
504
ATTACHING THE FLOOR MEMBERS TO THE LONGITUDINAL MEMBER
506
CREATING A CONTOUR IN THE UPPER SURFACE(S) OF THE LONGITUDINAL STRENGTHENING MEMBER(S) TO RENDER THEM COPLANAR WITH ADJACENT CONTOUR OF FLOOR MEMBER(S)
516
FASTENING OR BONDING
510
APPLYING A WATERTIGHT SEALANT TO THE LONGITUDINAL MEMBER AND FLOOR MEMBERS
512
END
514

FIG. 10A

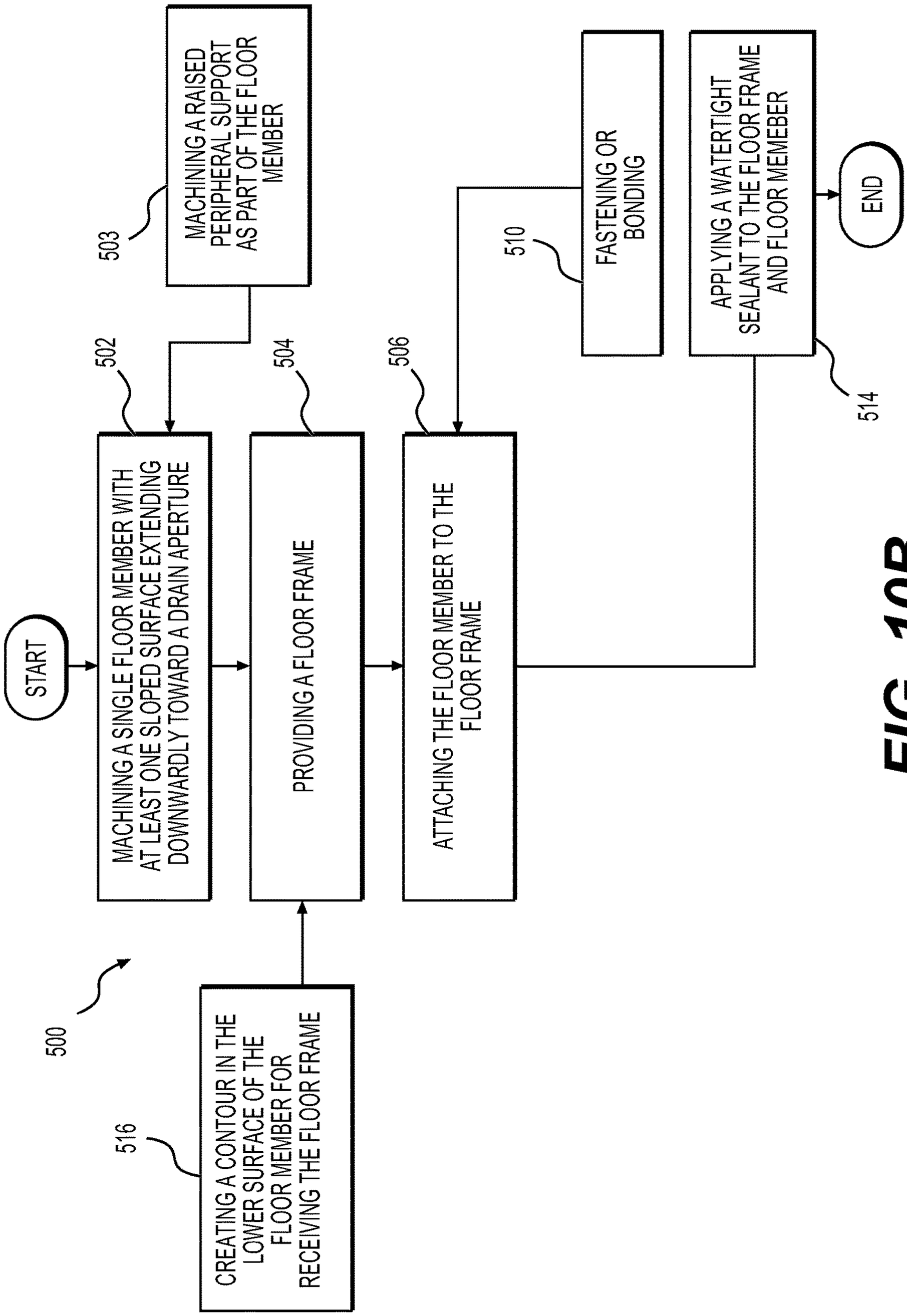

START
MACHINING A SINGLE FLOOR MEMBER WITH AT LEAST ONE SLOPED SURFACE EXTENDING DOWNWARDLY TOWARD A DRAIN APERTURE
502
PROVIDING A FLOOR FRAME
504
ATTACHING THE FLOOR MEMBER TO THE FLOOR FRAME
506
FASTENING OR BONDING
510
APPLYING A WATERTIGHT SEALANT TO THE FLOOR FRAME AND FLOOR MEMEBER
512
END
514
MACHINING A RAISED PERIPHERAL SUPPORT AS PART OF THE FLOOR MEMBER
503
CREATING A CONTOUR IN THE LOWER SURFACE OF THE FLOOR MEMBER FOR RECEIVING THE FLOOR FRAME
516
500

FIG. 10B

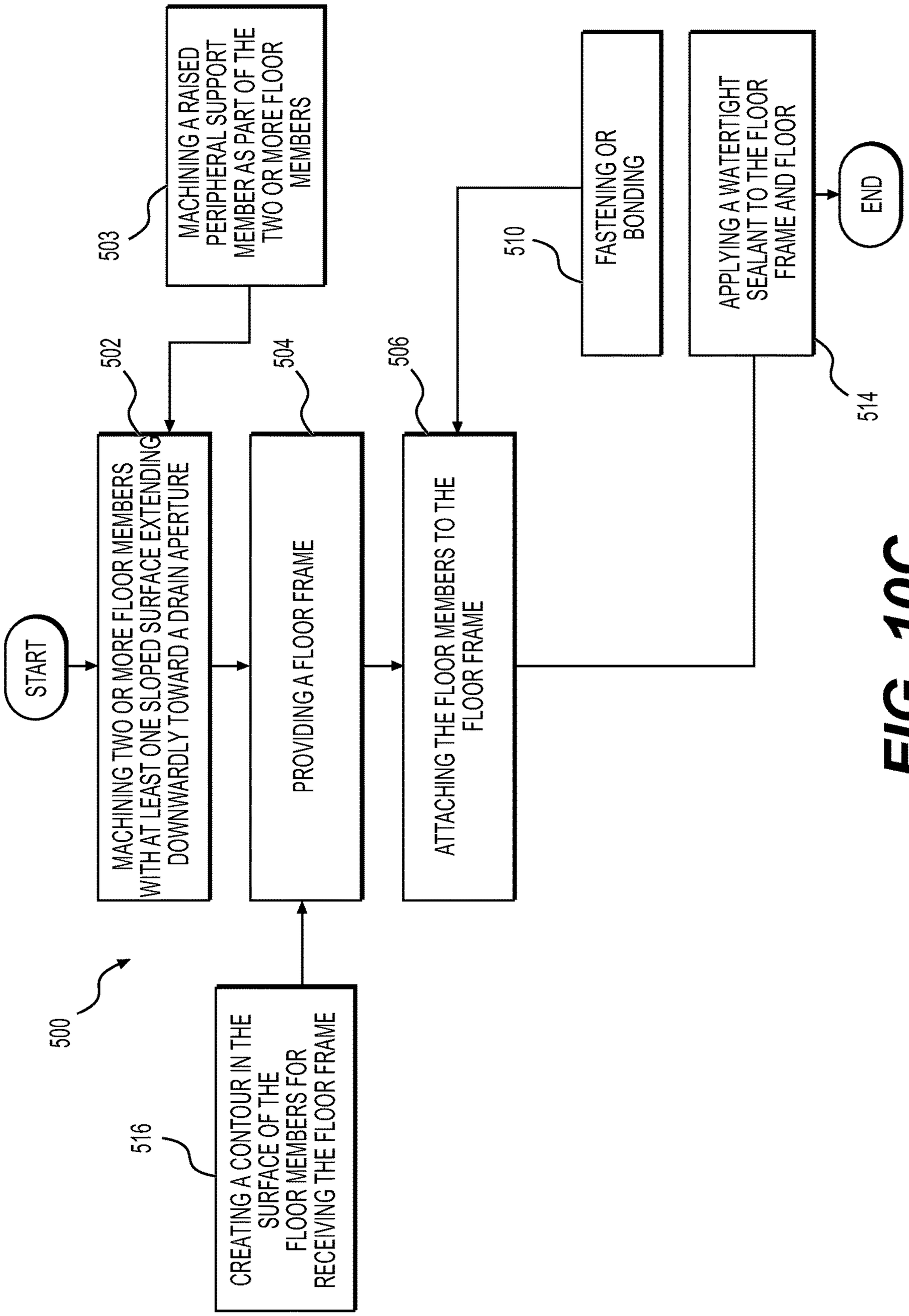

START
500
MACHINING TWO OR MORE FLOOR MEMBERS WITH AT LEAST ONE SLOPED SURFACE EXTENDING DOWNWARDLY TOWARD A DRAIN APERTURE
502
MACHINING A RAISED PERIPHERAL SUPPORT MEMBER AS PART OF THE TWO OR MORE FLOOR MEMBERS
503
PROVIDING A FLOOR FRAME
504
ATTACHING THE FLOOR MEMBERS TO THE FLOOR FRAME
506
CREATING A CONTOUR IN THE SURFACE OF THE FLOOR MEMBERS FOR RECEIVING THE FLOOR FRAME
516
FASTENING OR BONDING
510
APPLYING A WATERTIGHT SEALANT TO THE FLOOR FRAME AND FLOOR
514
END

FIG. 10C

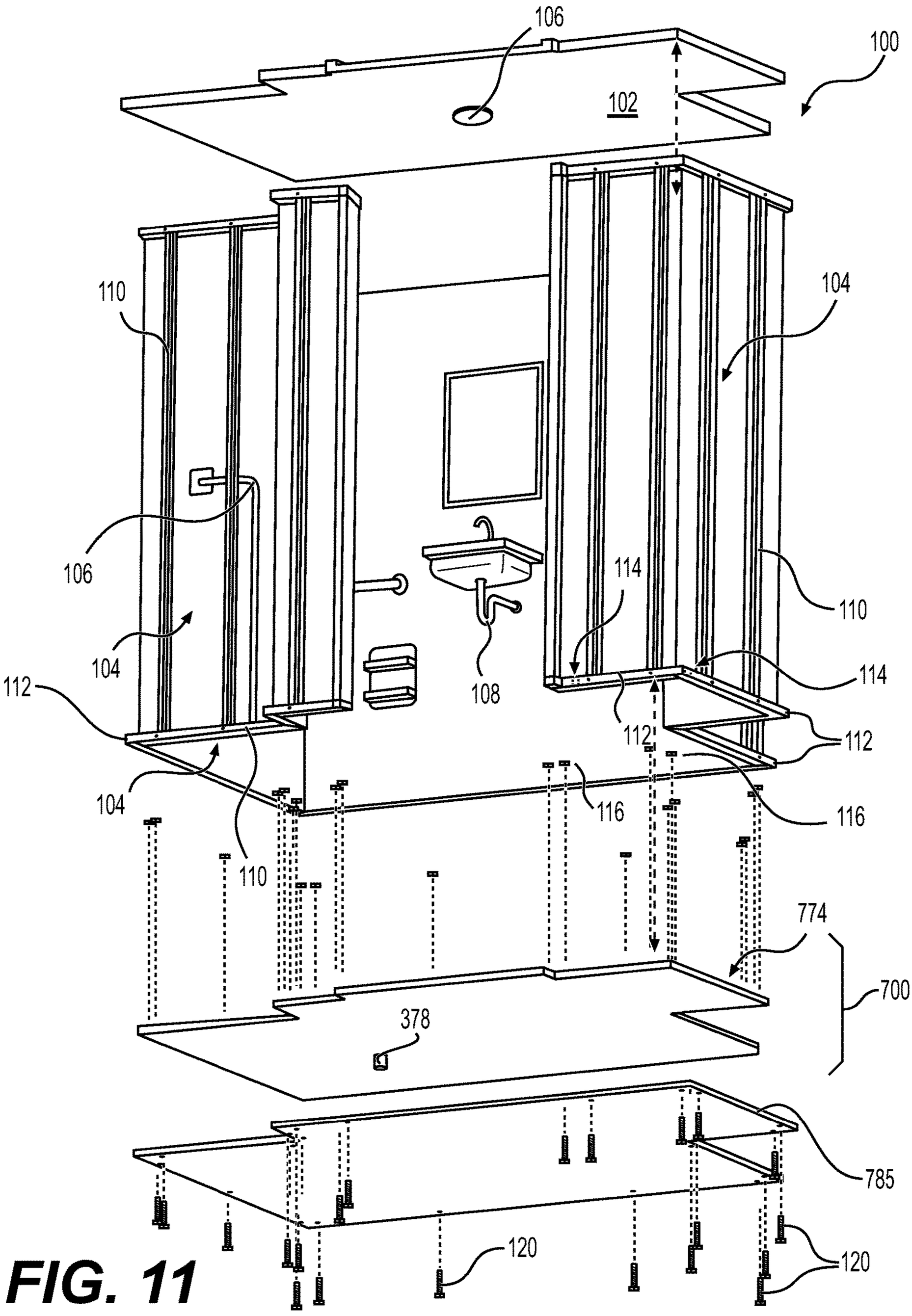

106
100
102
110
104
106
104
112
108
114
110
114
112
112
104
116
116
110
774
700
378
785
120
120

FIG. 11

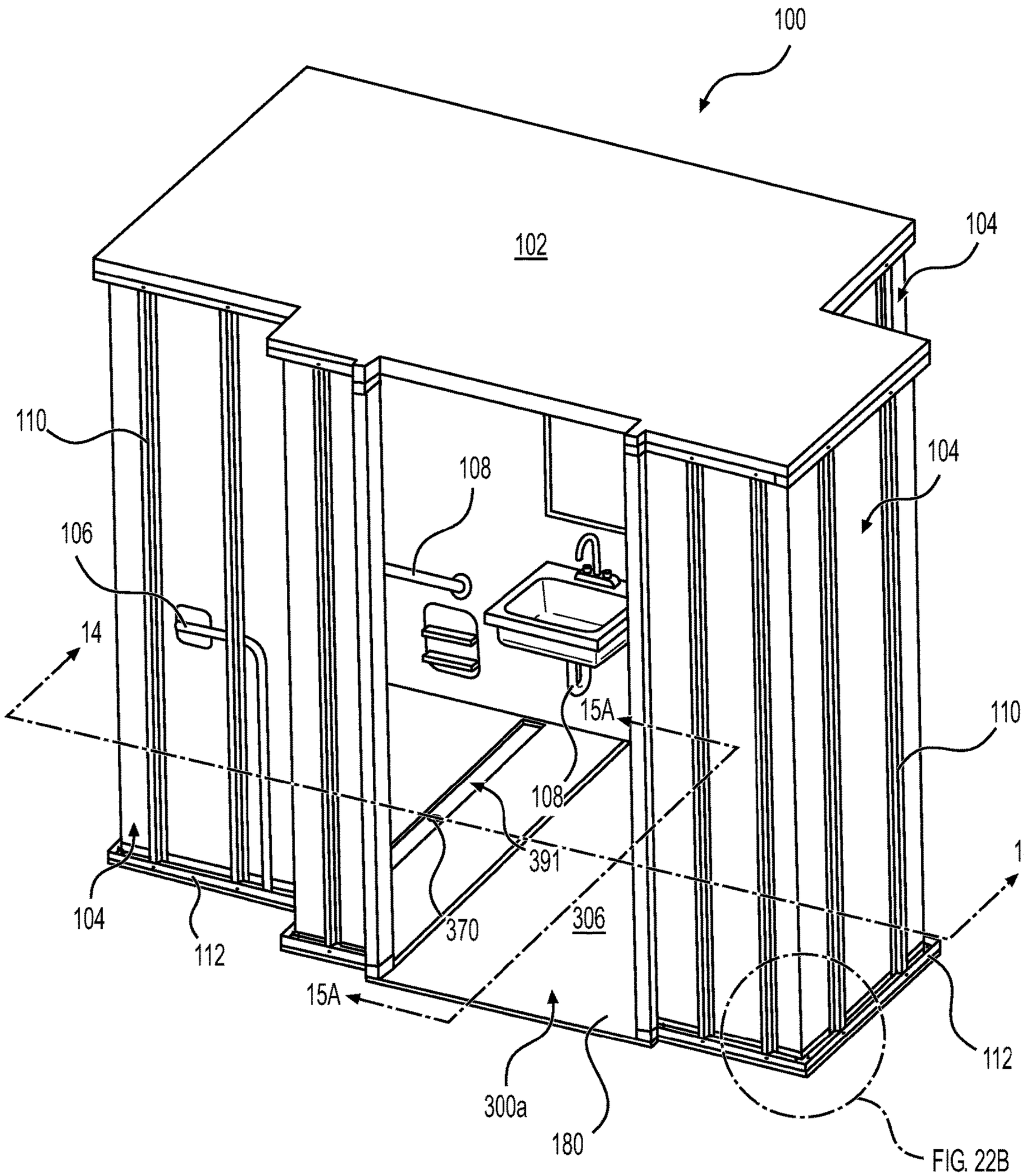

100
102
104
104
104
110
110
108
108
106
14
14
15A
15A
391
370
306
104
112
112
300a
180
FIG. 22B

FIG. 12

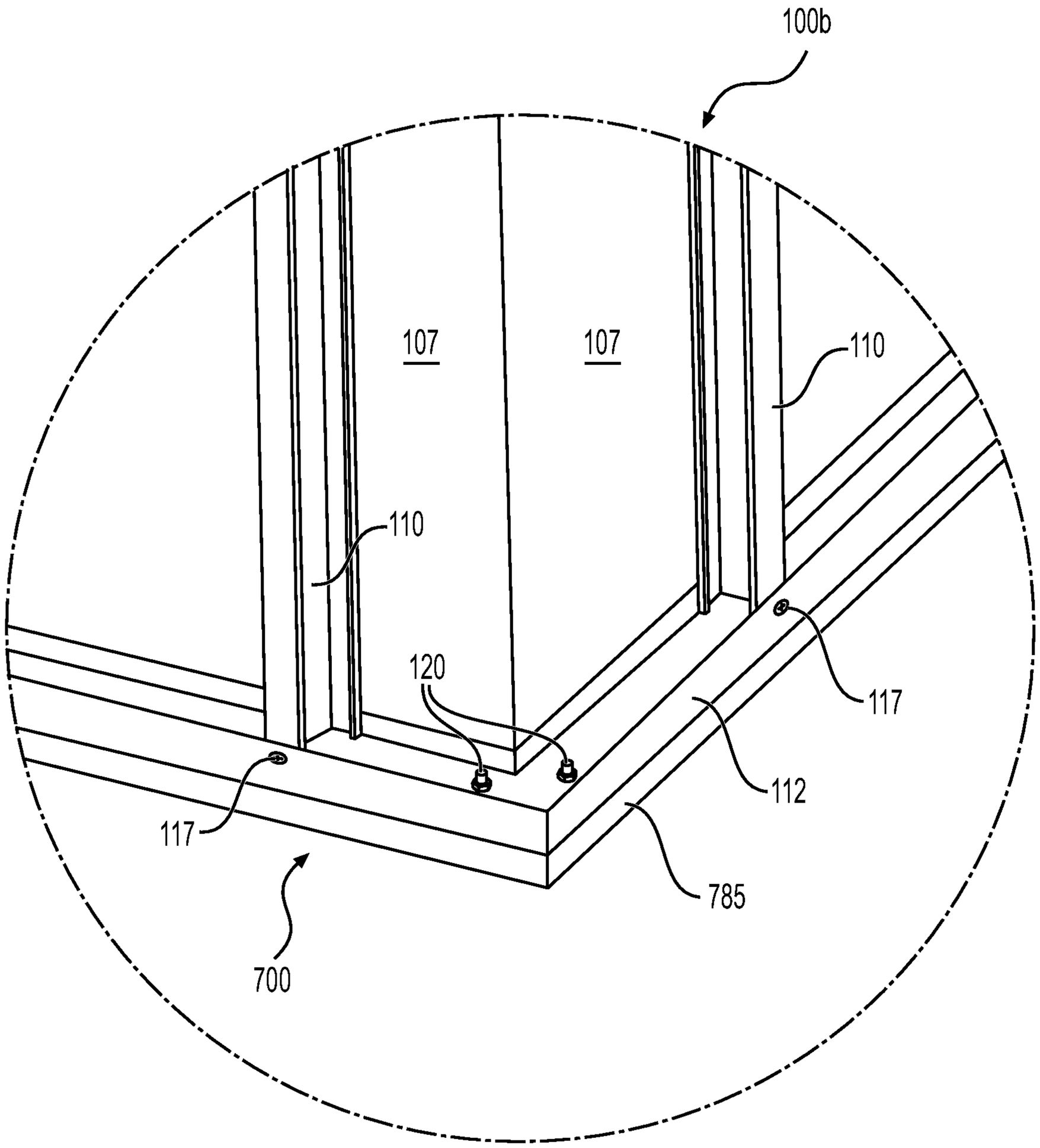


FIG. 13

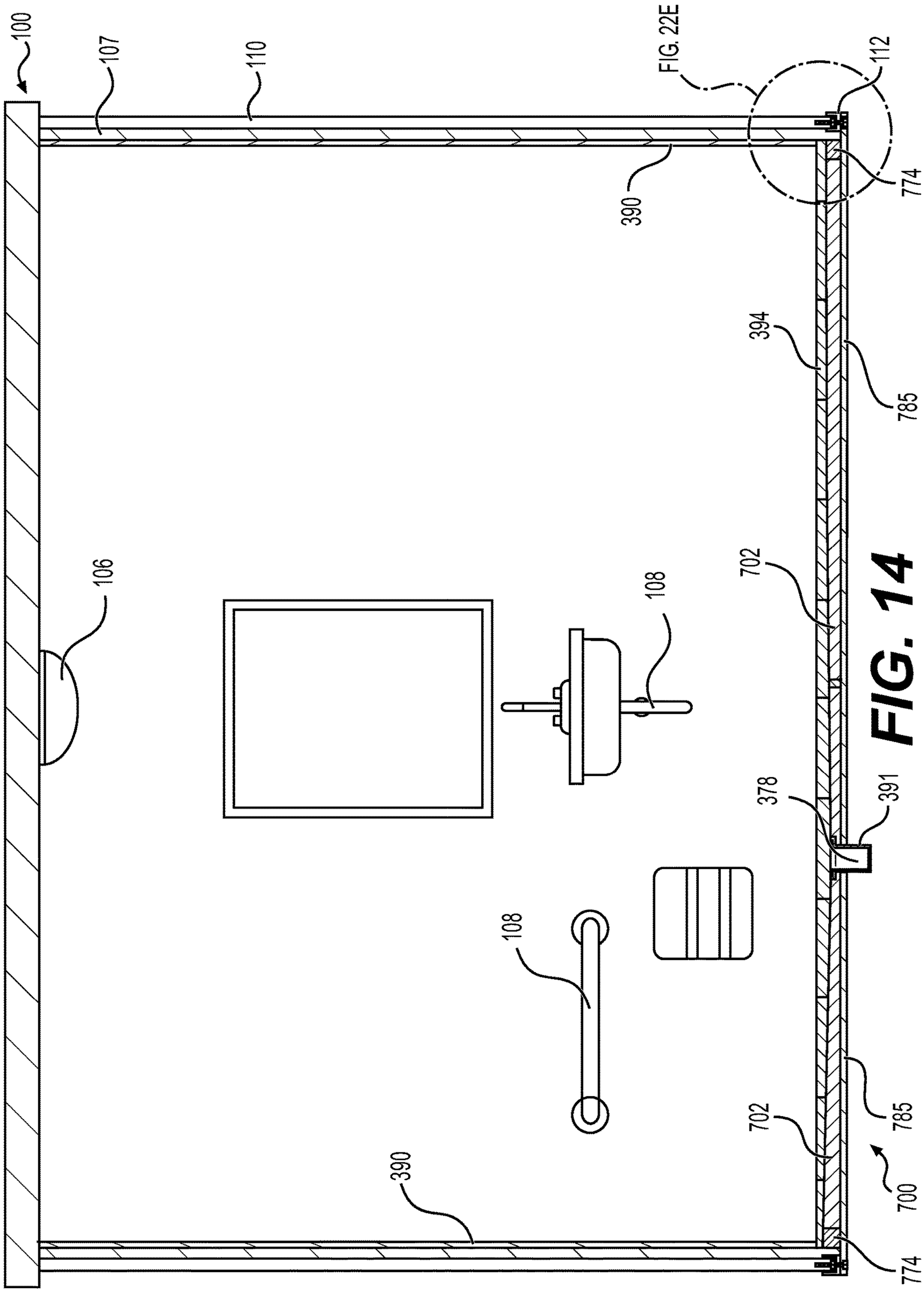

100
107
110
FIG. 22E
112
774
390
394
785
702
106
108
108
378
391
702
785
700
390
774

FIG. 14

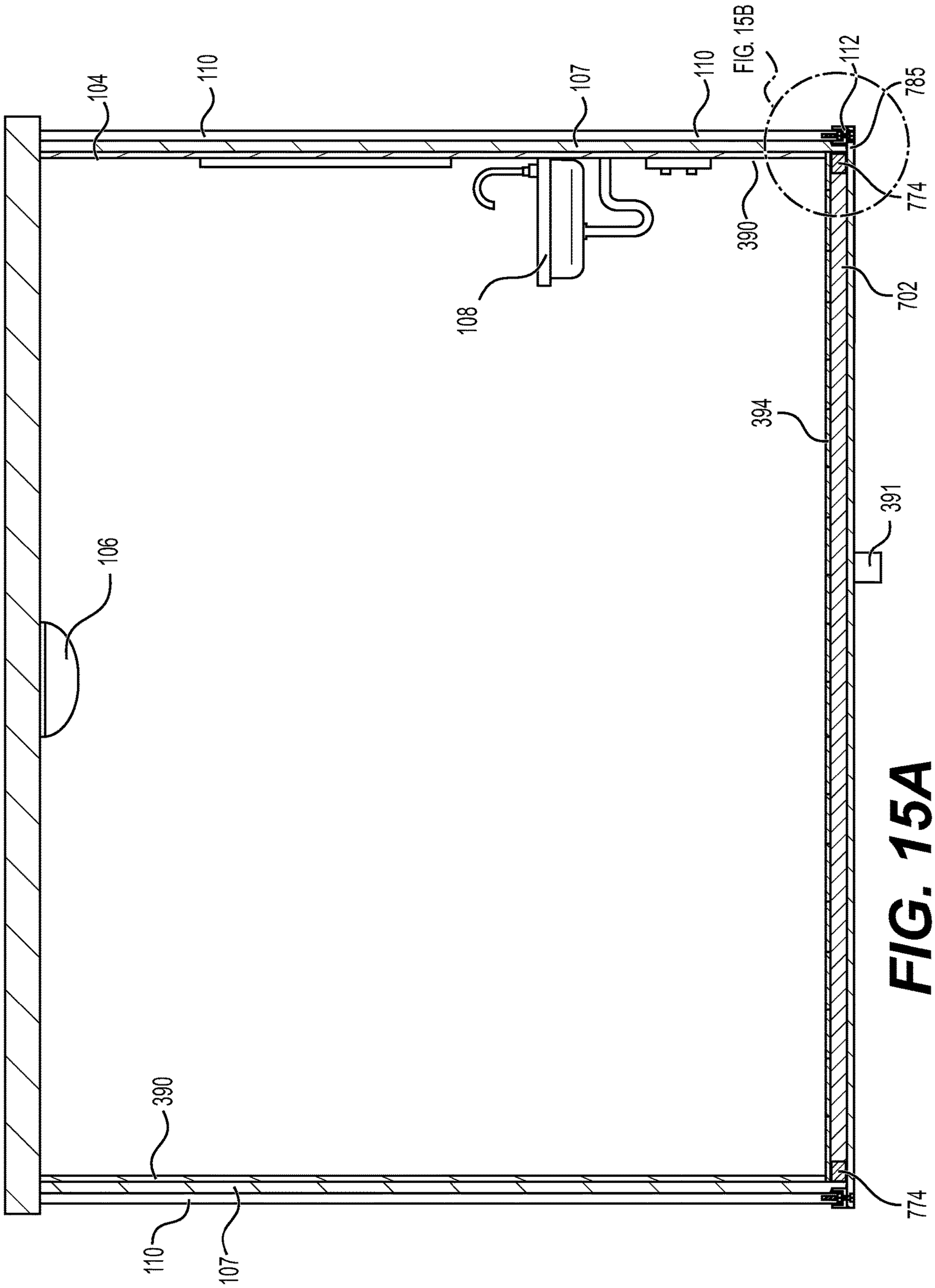

104
110
107
110
FIG. 15B
112
785
774
390
702
108
394
391
106
390
110
107
774

FIG. 15A

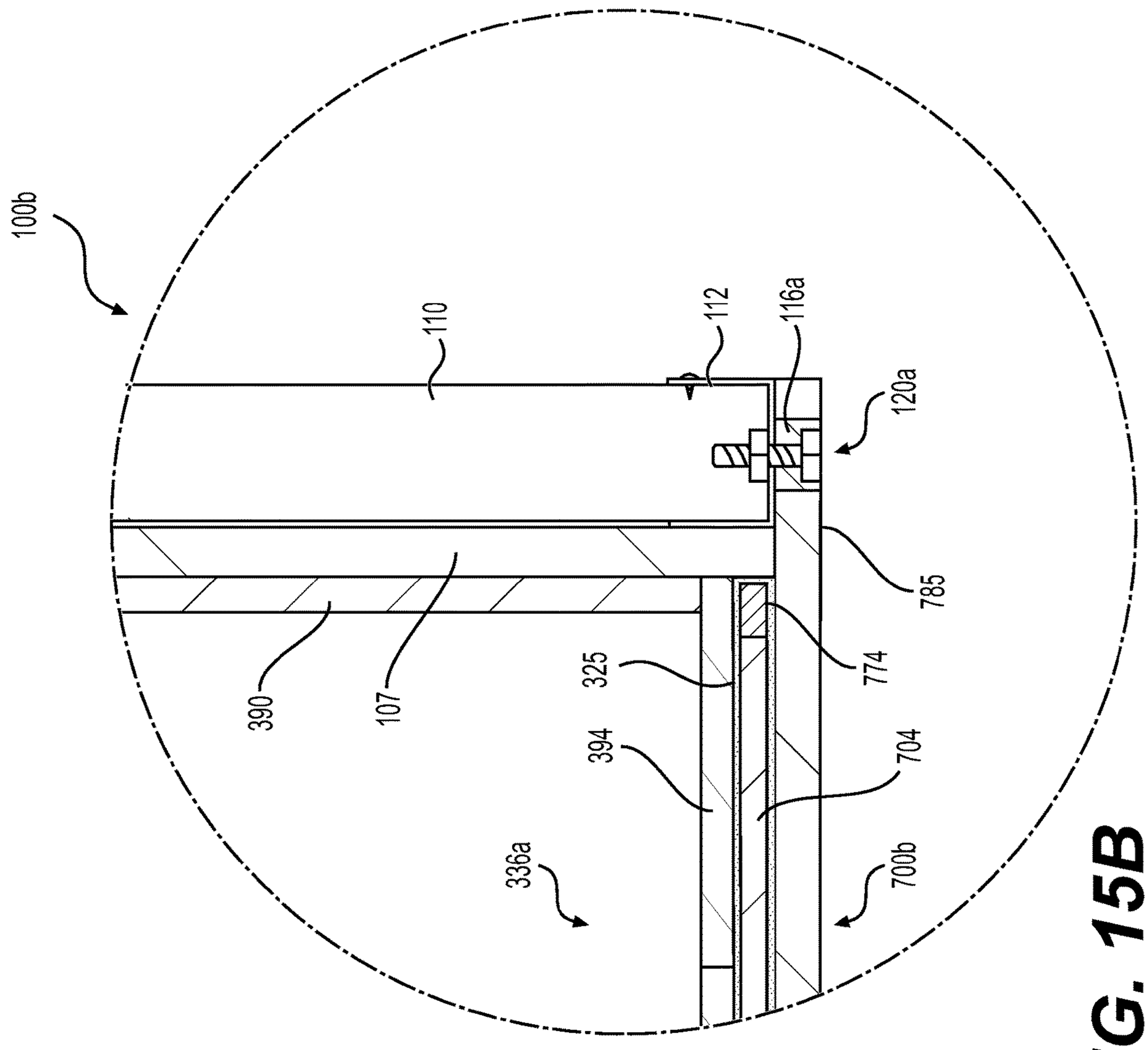


FIG. 15B

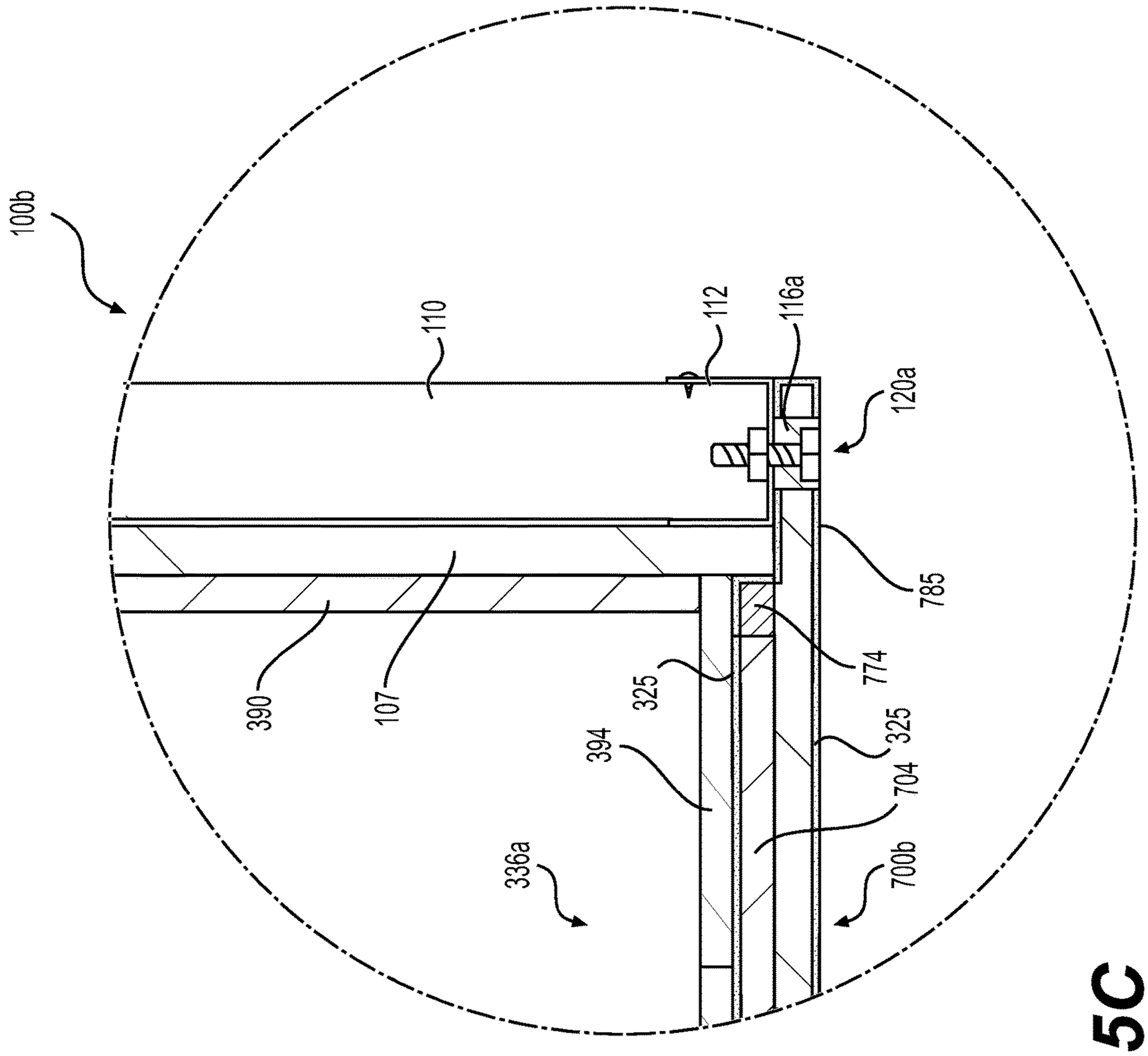

100b
110
112
116a
120a
785
774
325
325
704
700b
394
336a
390
107

FIG. 15C

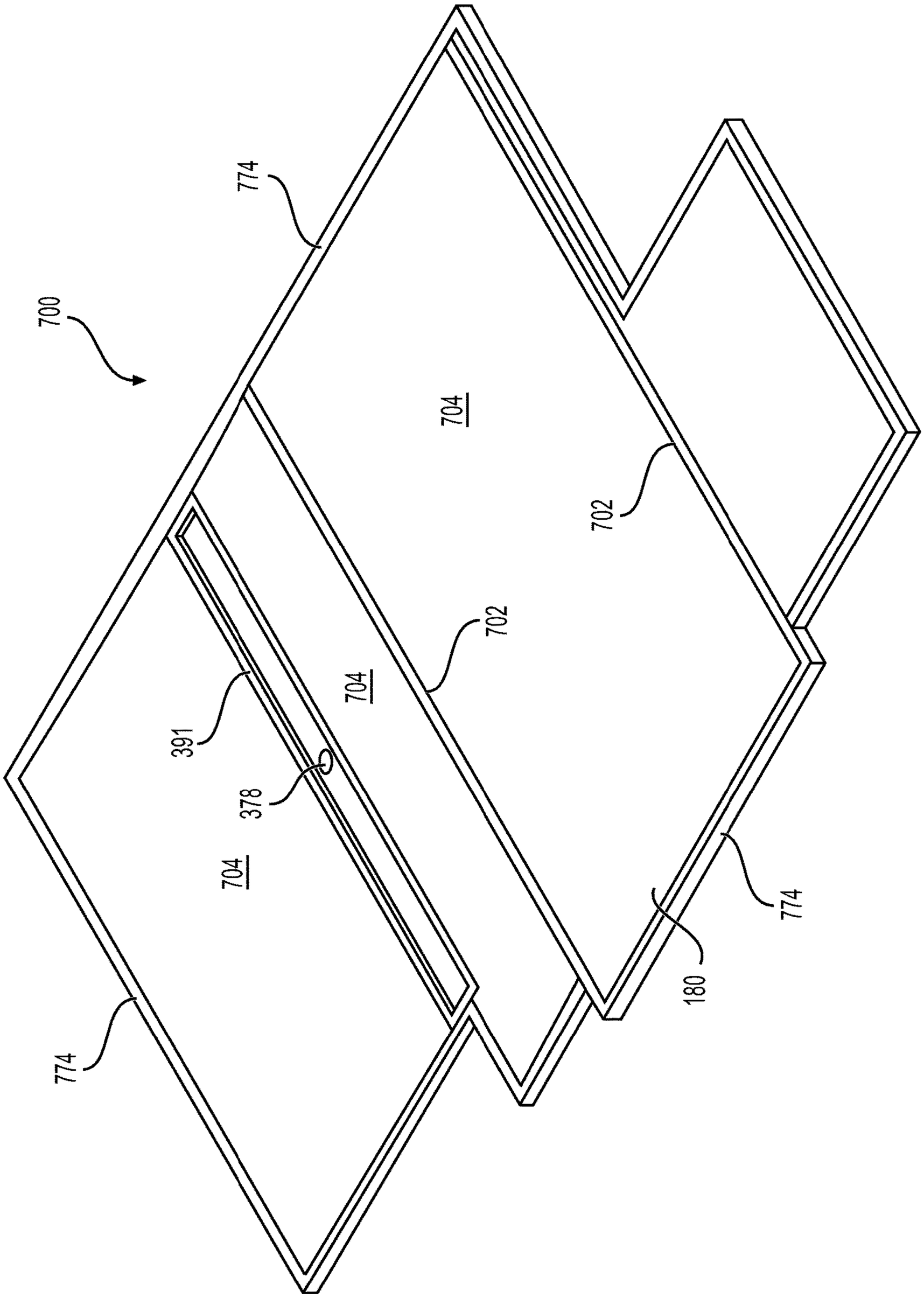


FIG. 16A

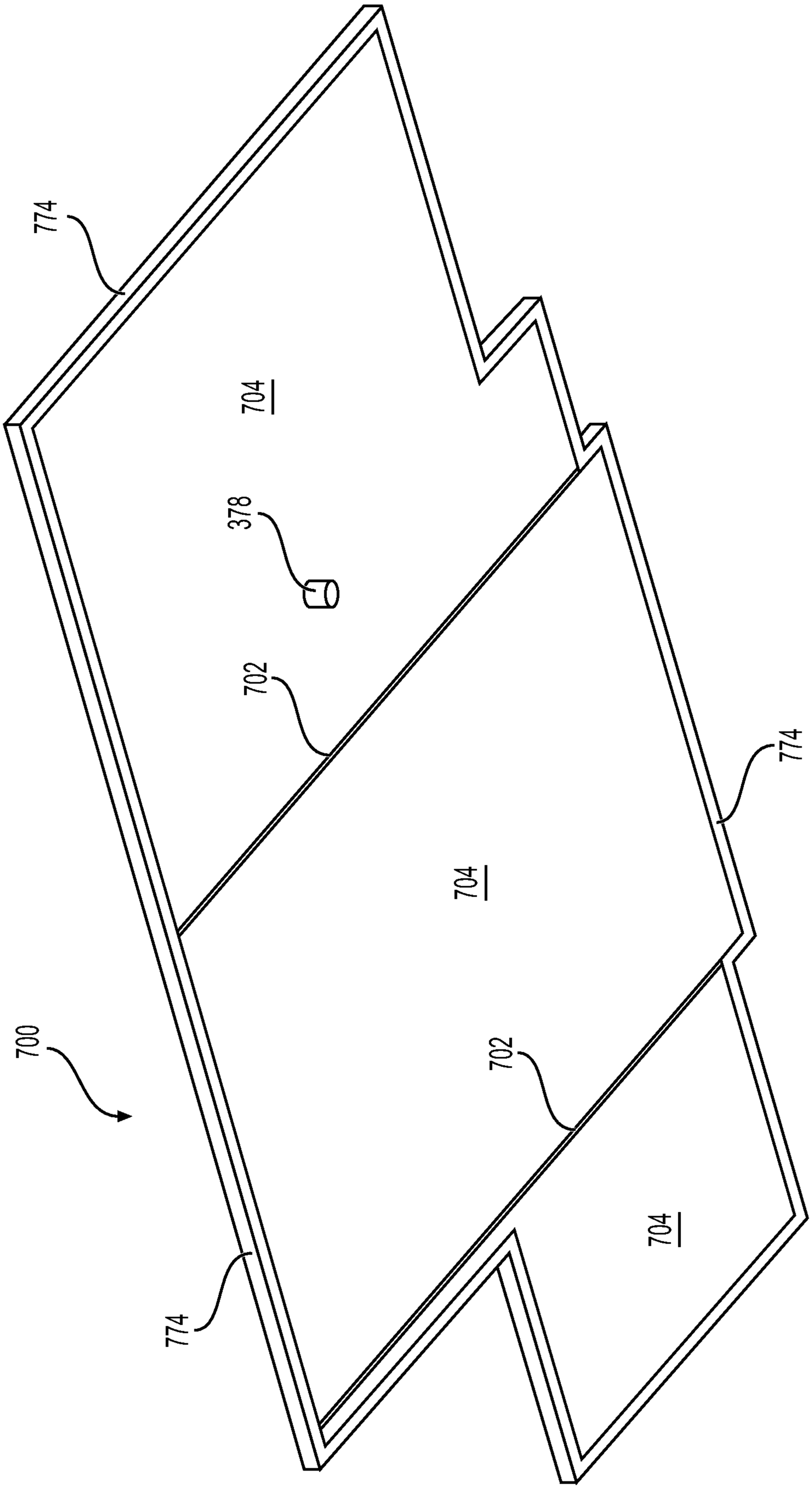


FIG. 16B

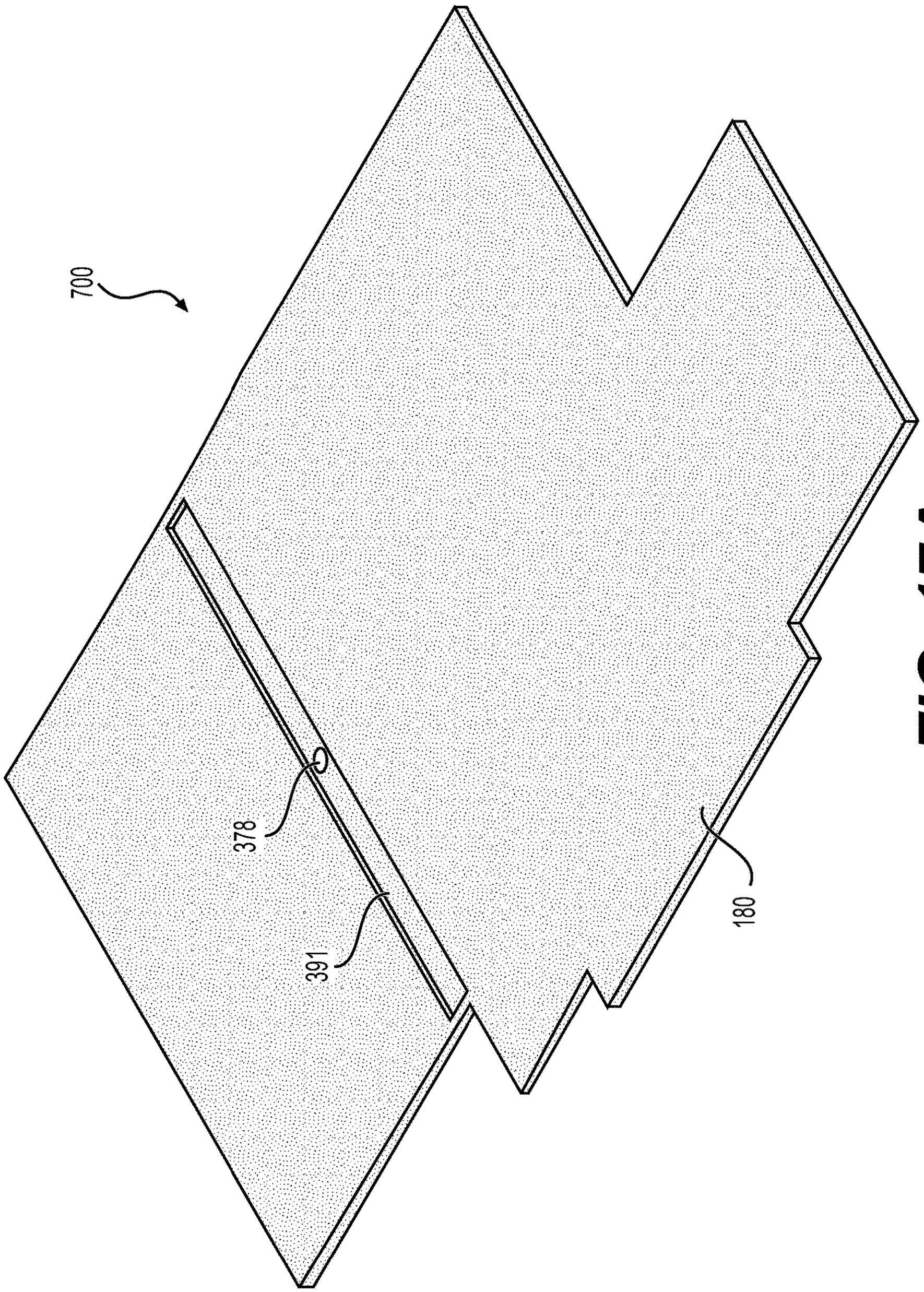


FIG. 17A

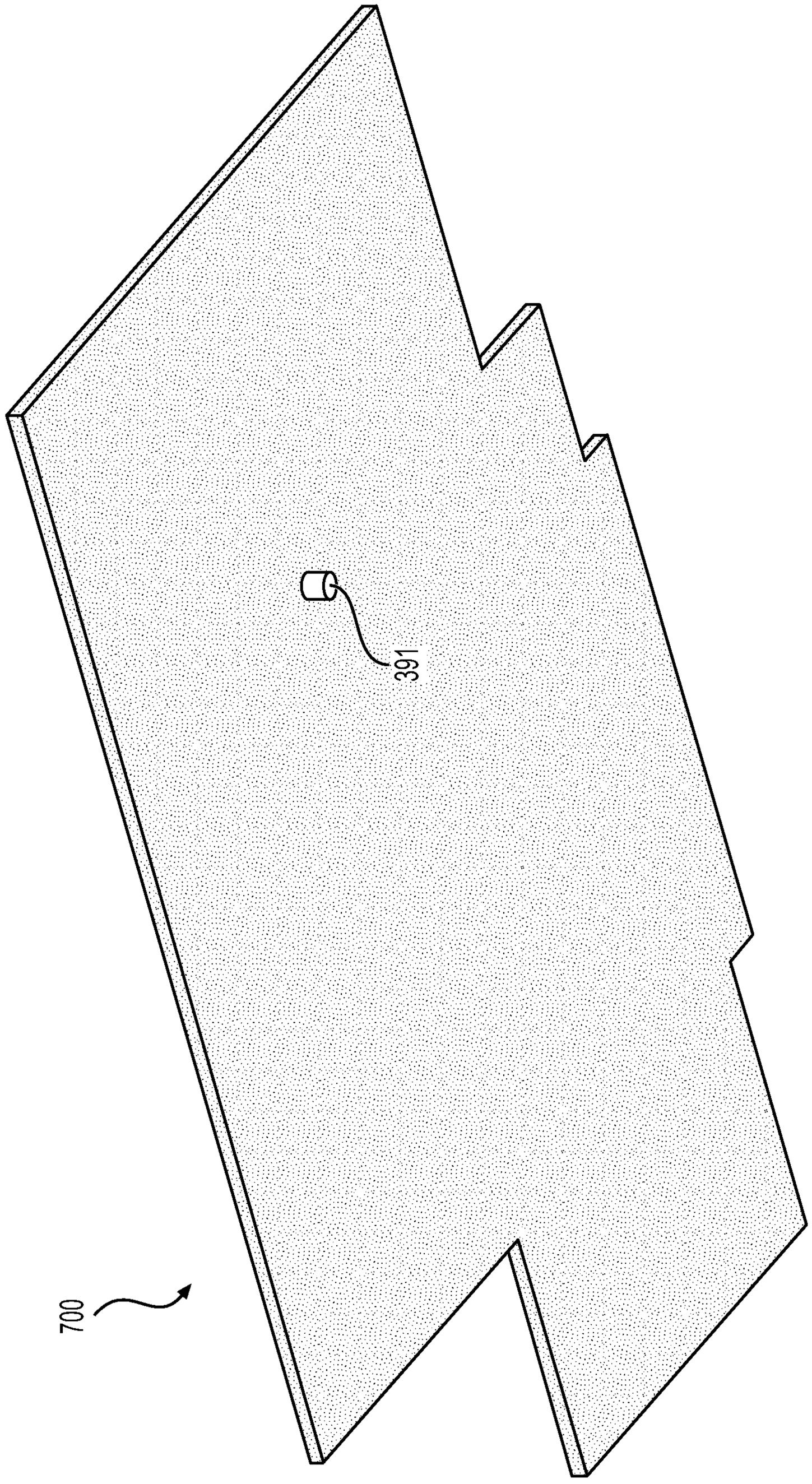


FIG. 17B

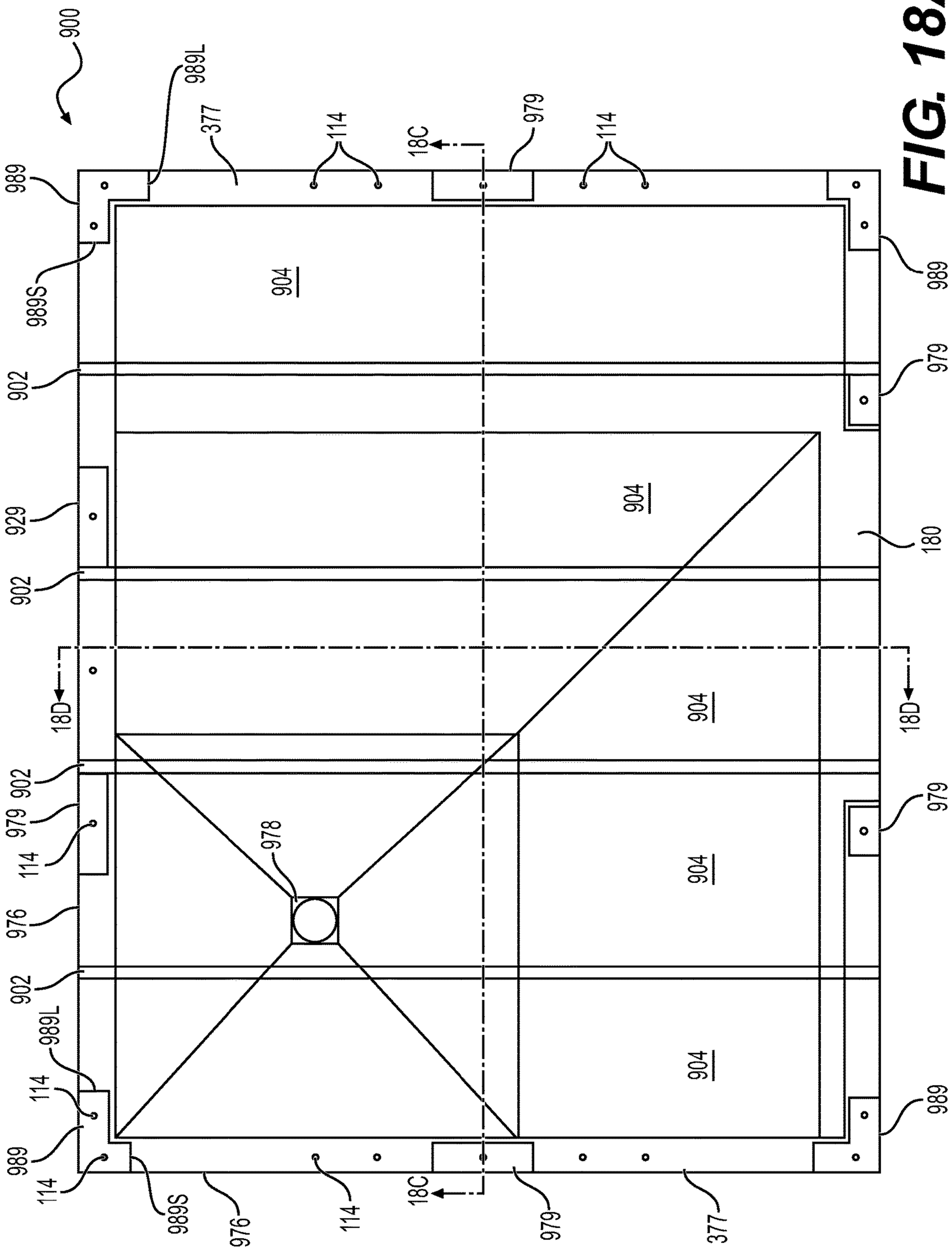
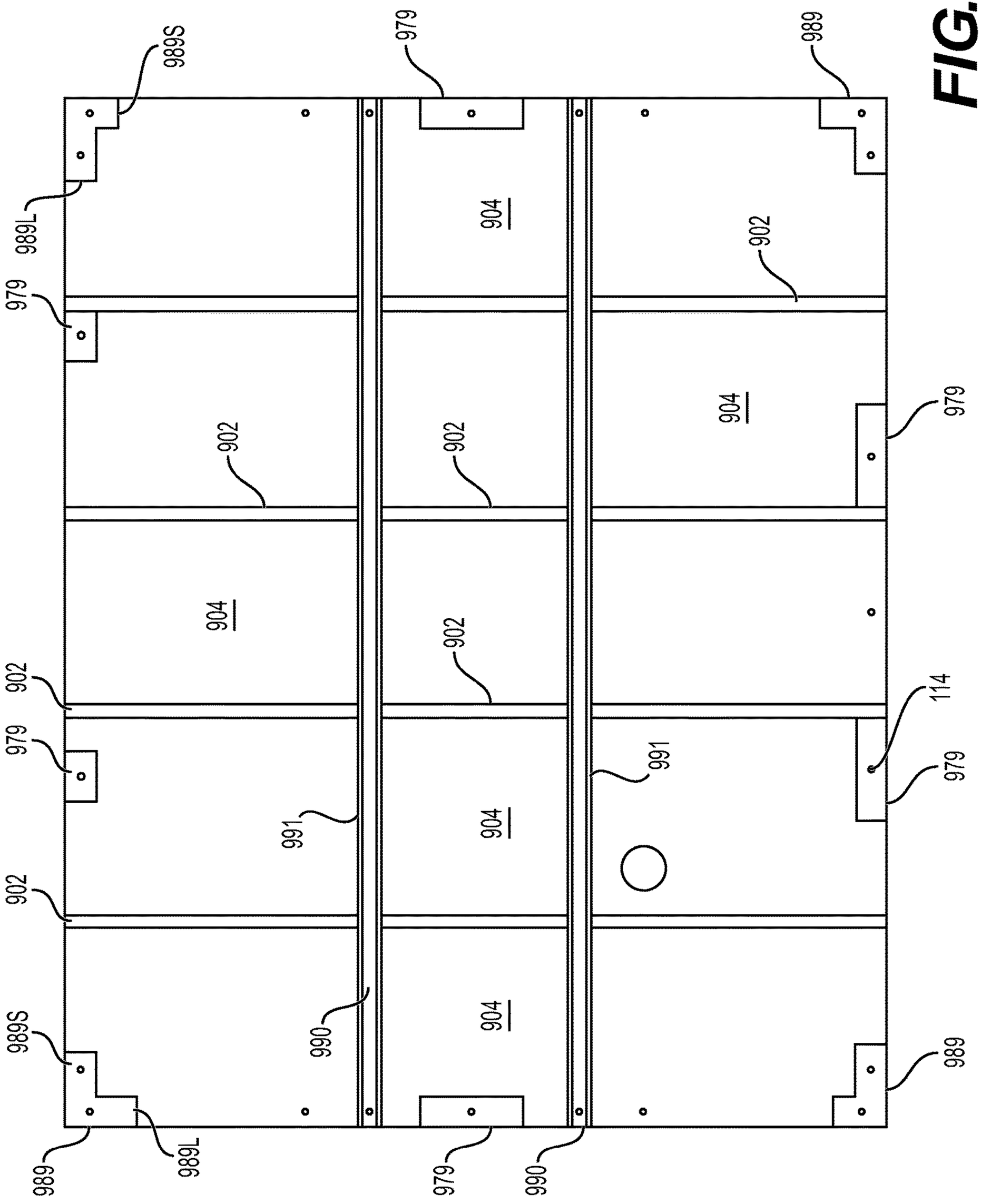

900
989L
377
114
18C
979
114
989
989S
904
902
979
929
902
180
902
18D
18D
902
979
114
978
979
976
902
989L
114
989
114
989S
976
114
18C
979
377
989

FIG. 18A

FIG. 18B



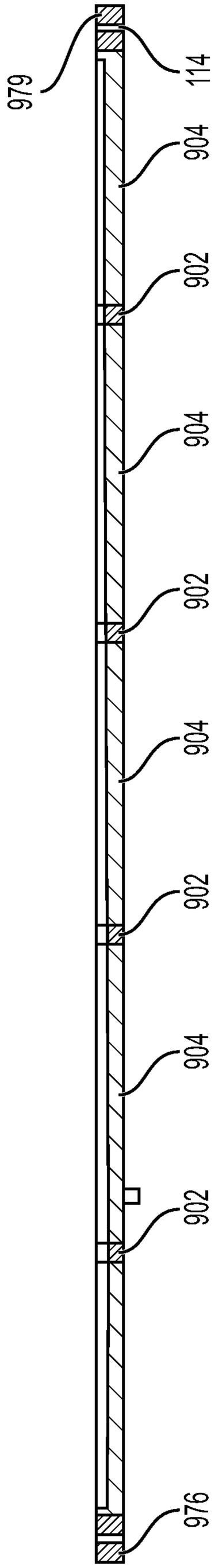


FIG. 18C

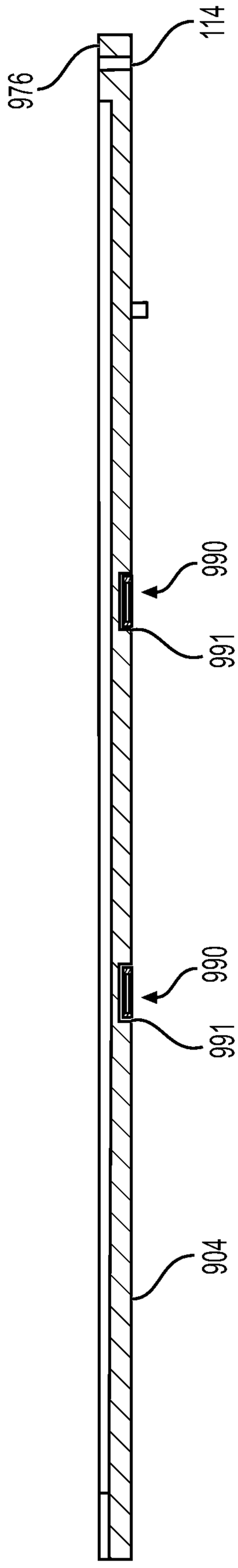


FIG. 18D

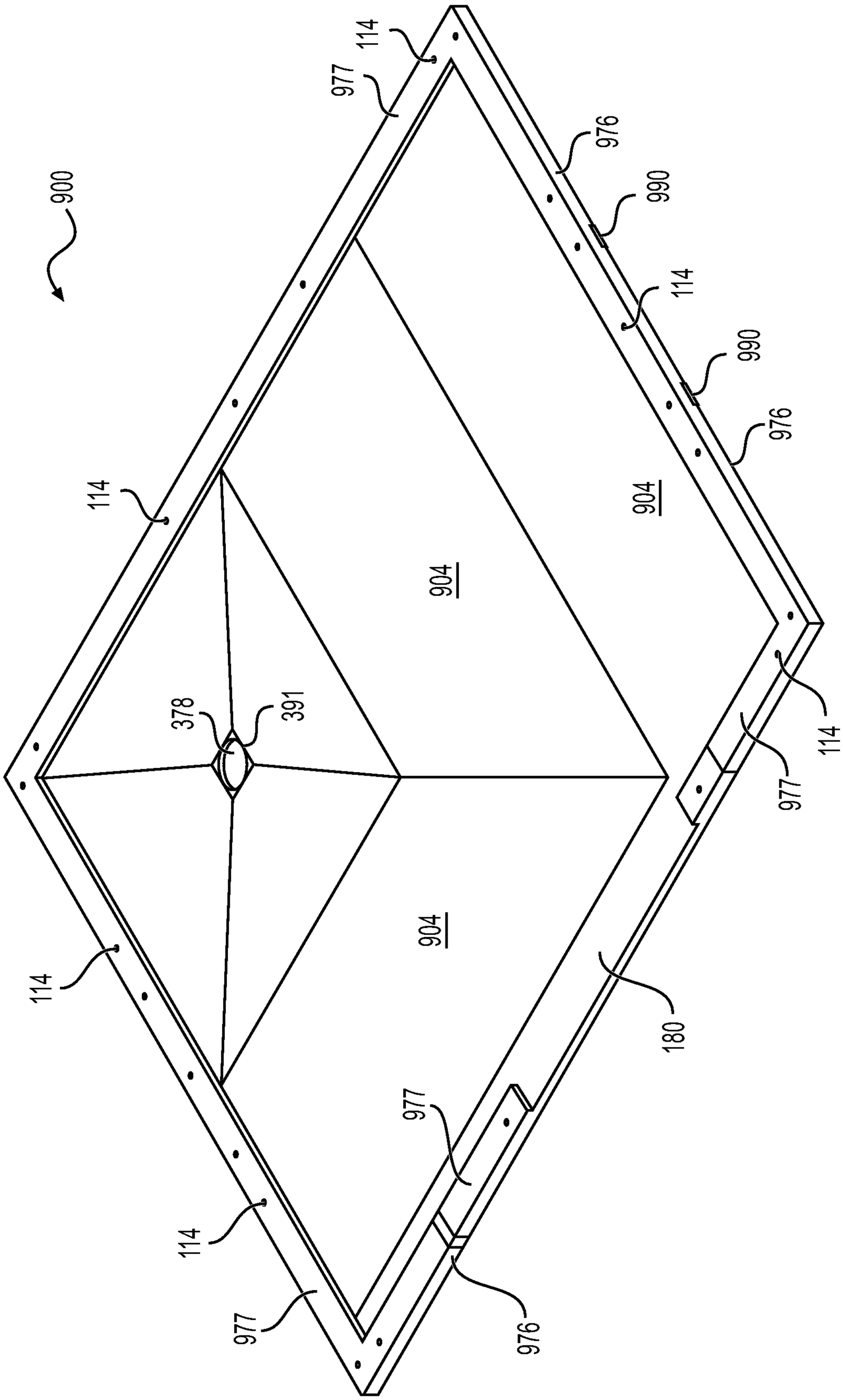

900
114
977
976
990
114
990
976
114
904
904
378
391
114
977
114
977
976
180

FIG. 18E

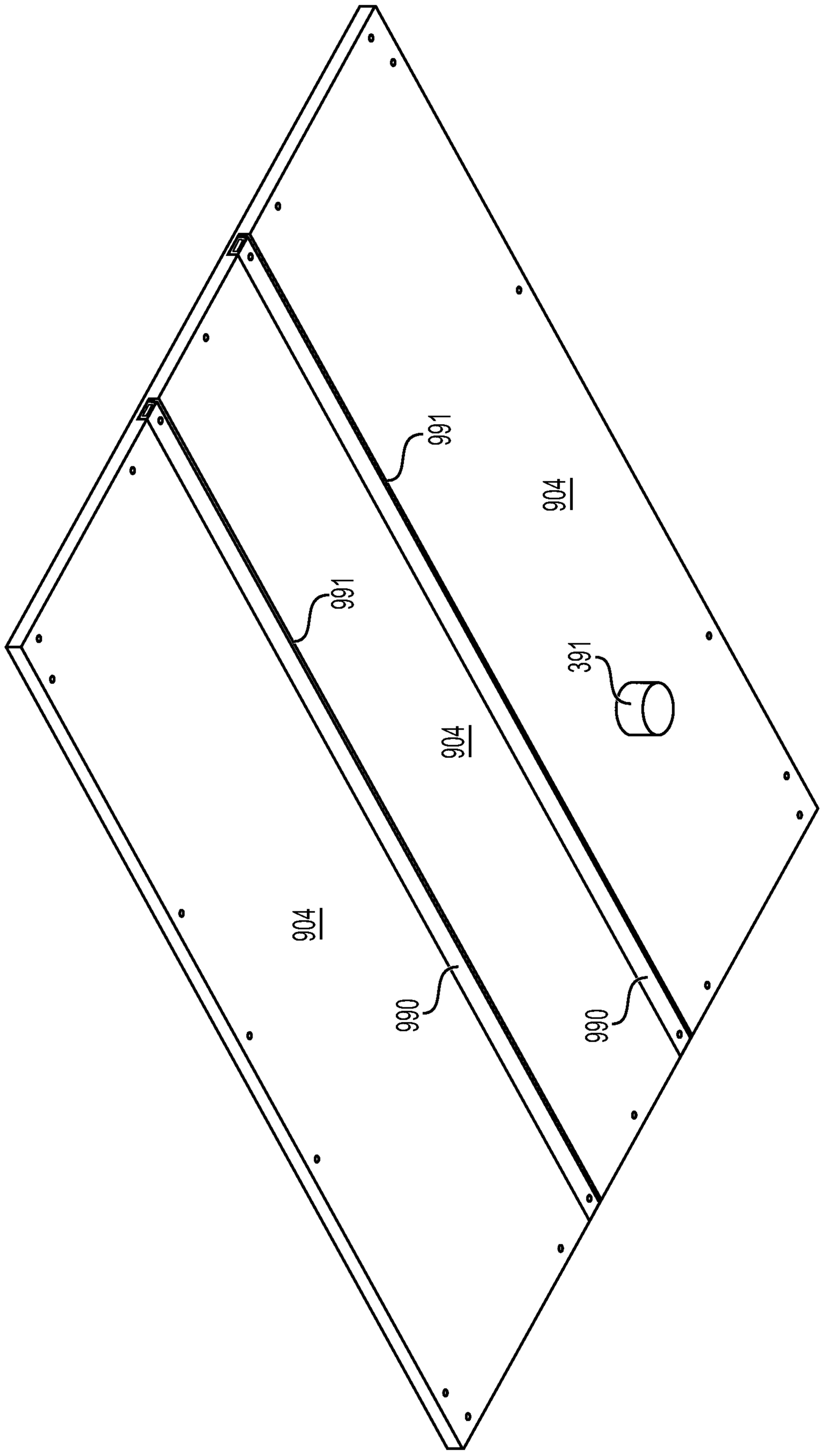


FIG. 18F

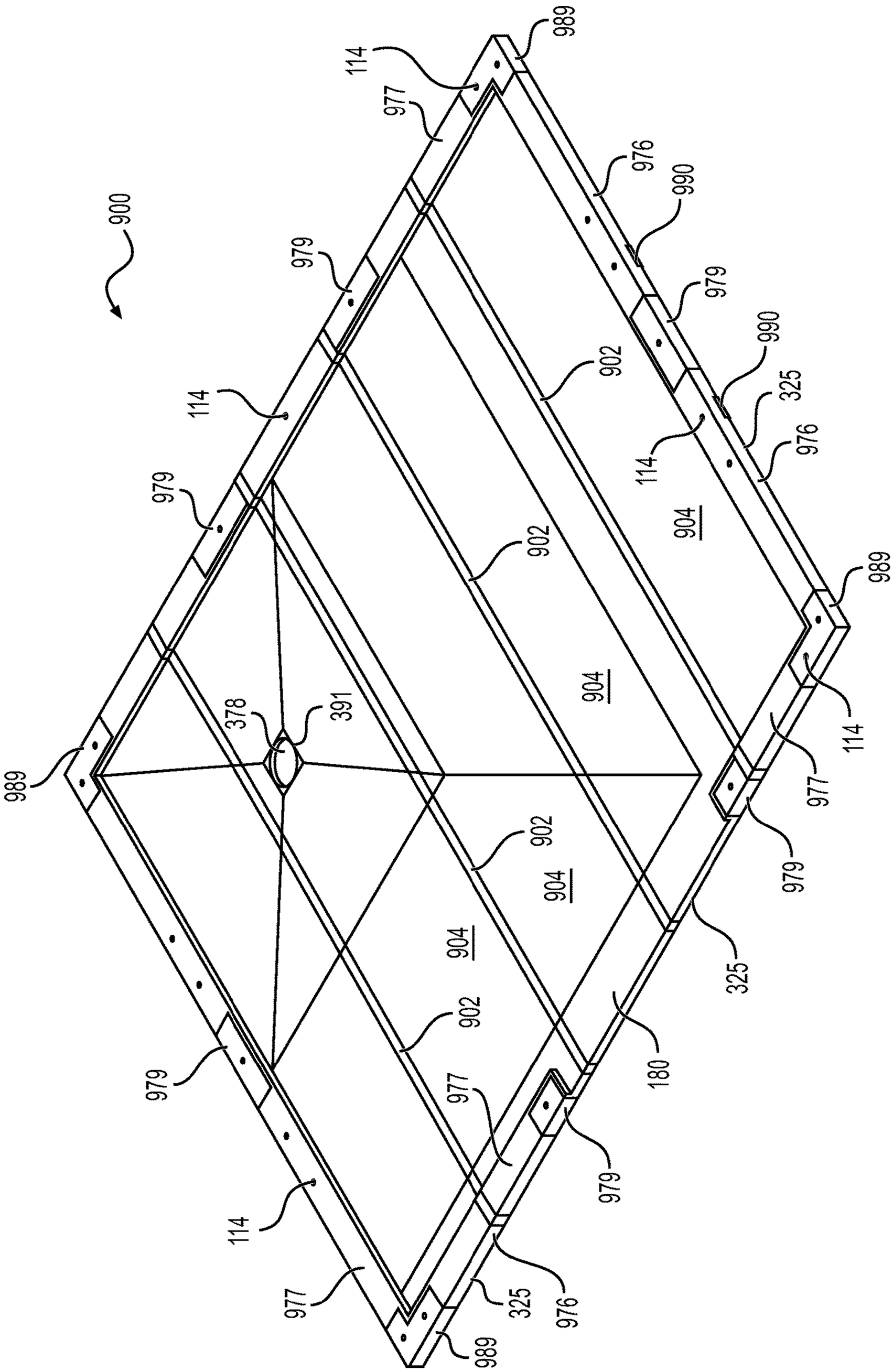


FIG. 18G

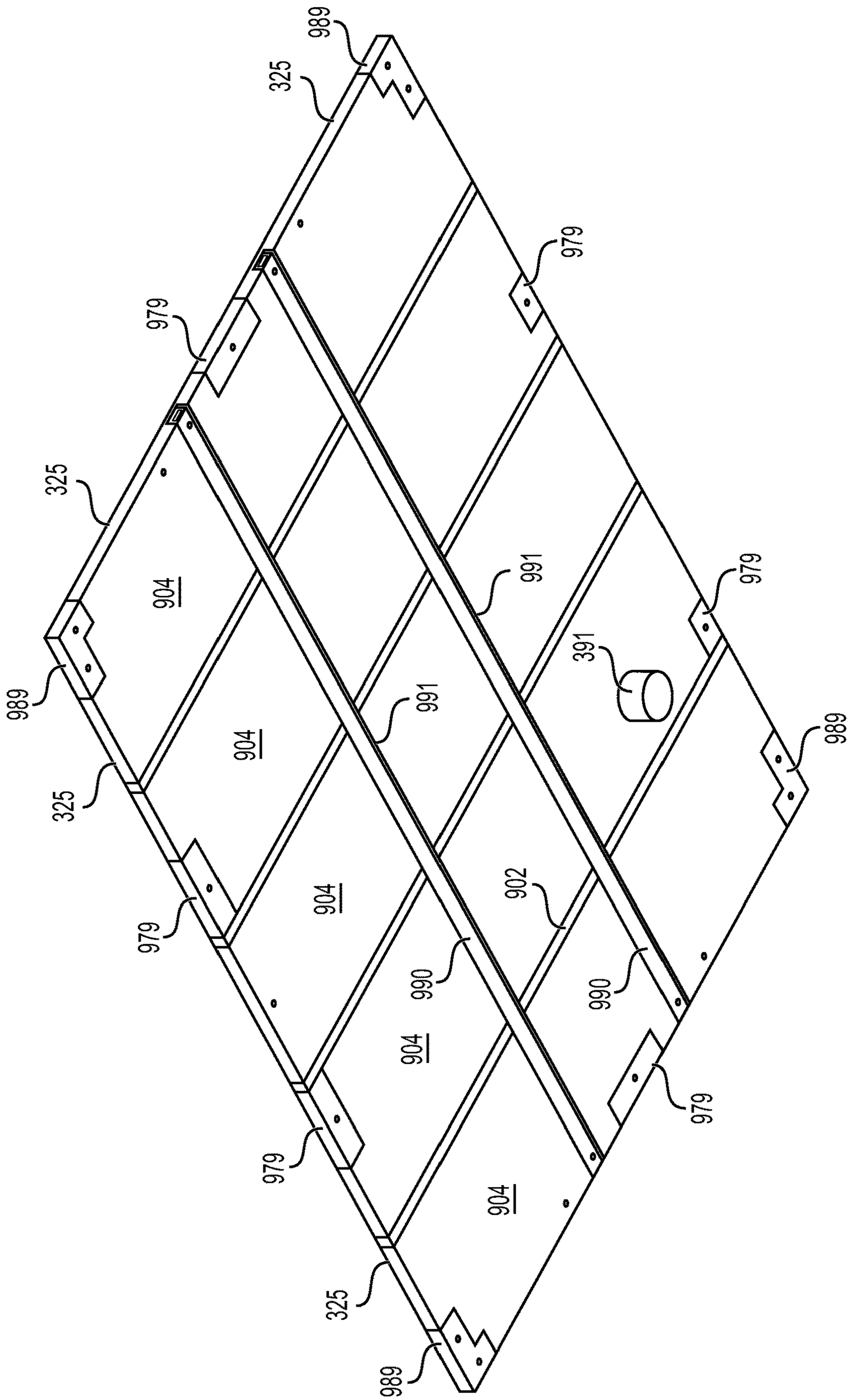

989
325
979
979
325
989
904
904
904
904
991
991
902
990
990
391
979
989
325
979
979
325
989

FIG. 18H

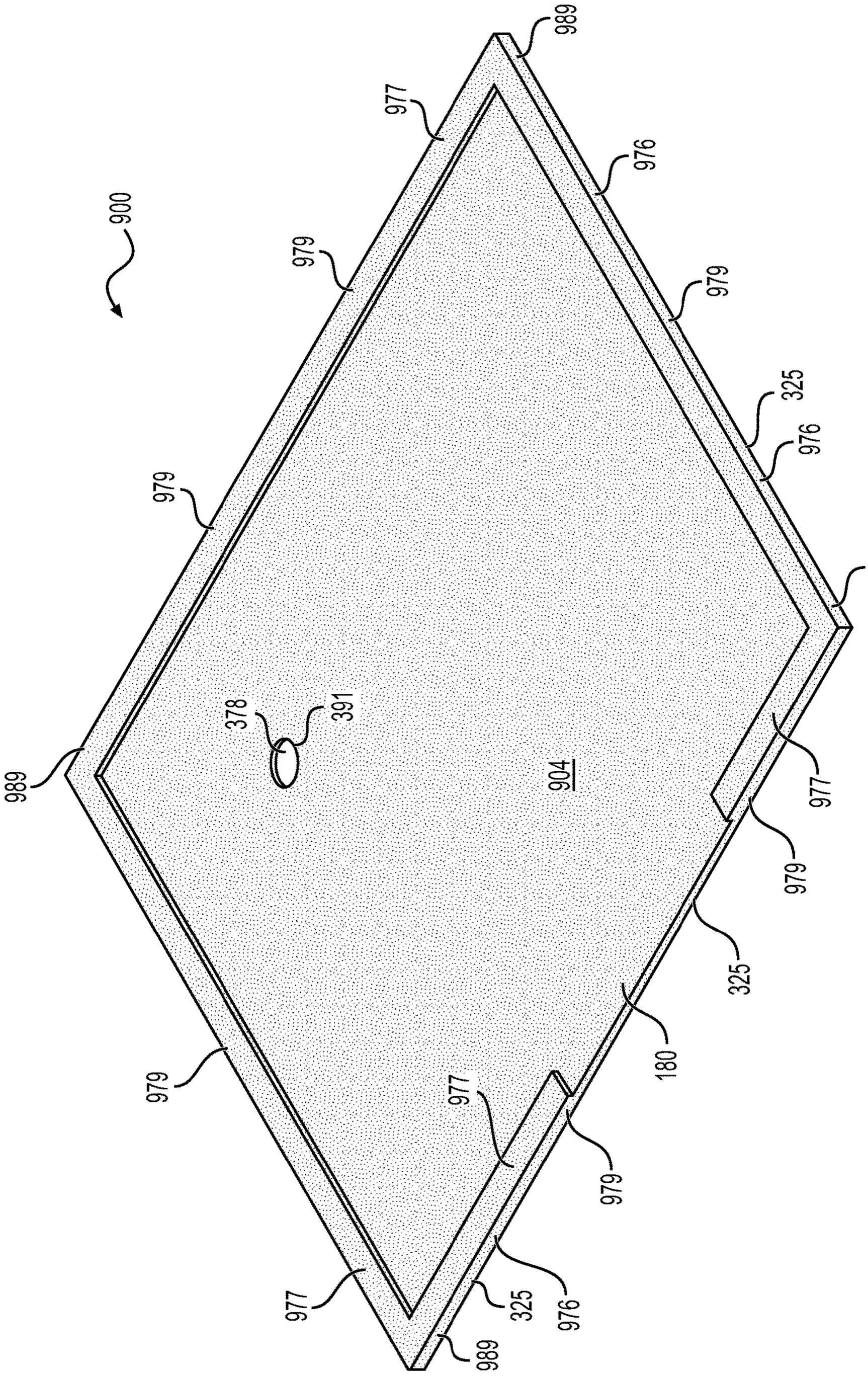

900
989
977
976
979
979
325
976
989
979
977
180
325
979
977
989
979
378
391
904
989
979
977
325
976

FIG. 18I

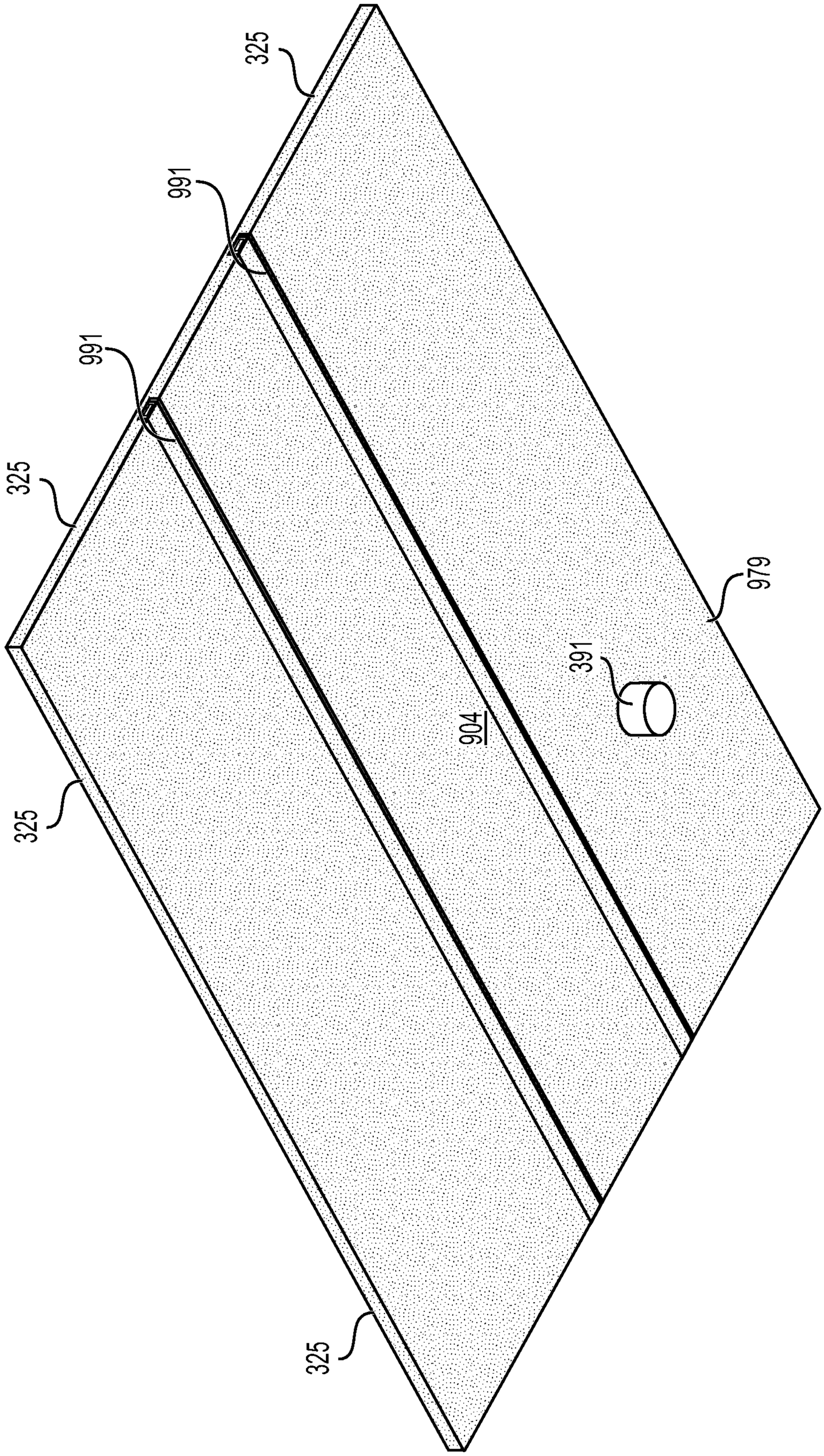


FIG. 18J

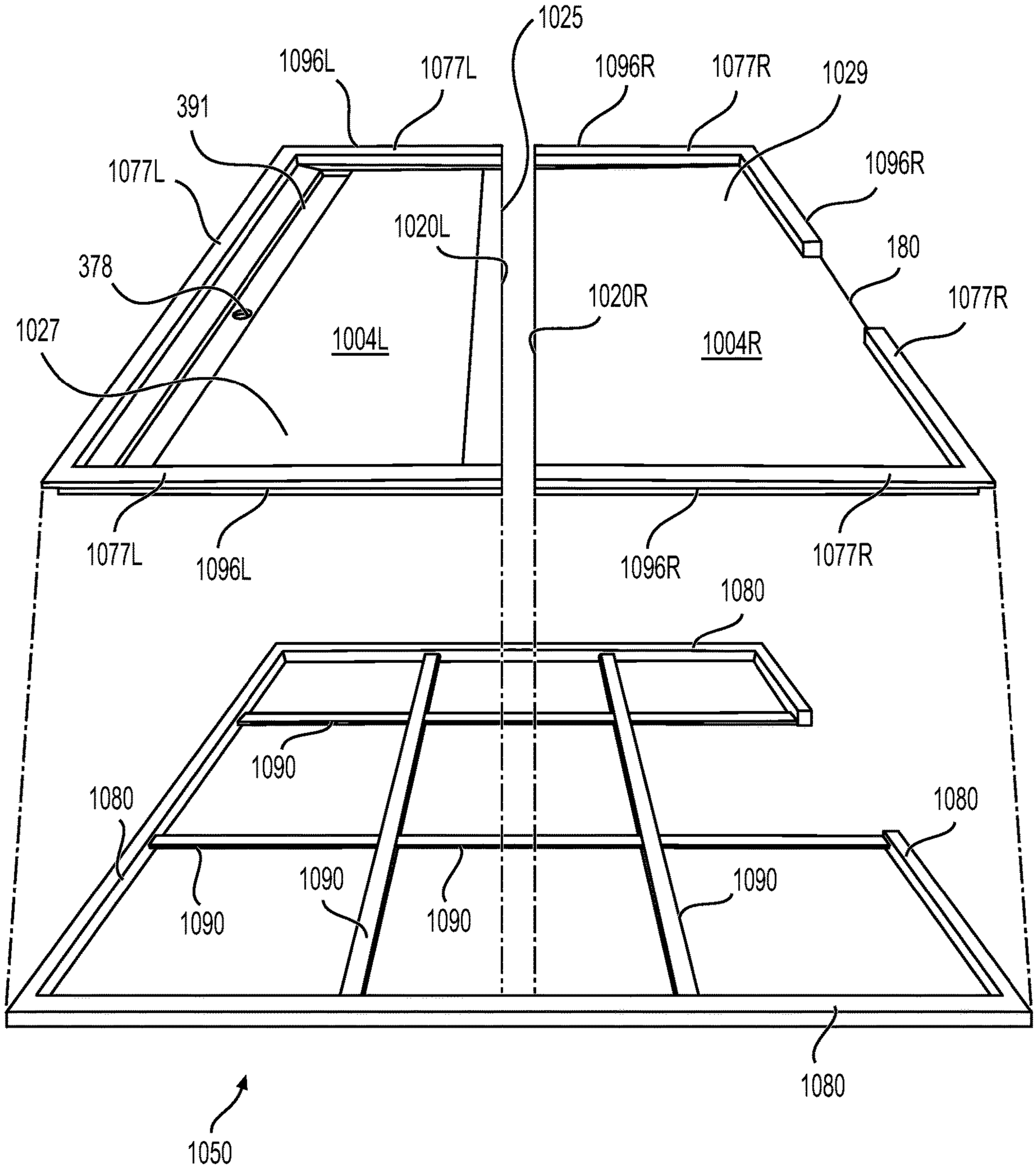

1025
1096L
1077L
1096R
1077R
1029
391
1077L
1096R
1020L
180
378
1020R
1077R
1027
1004L
1004R
1077L
1096L
1096R
1077R
1080
1090
1080
1080
1090
1090
1090
1090
1080
1050

FIG. 19

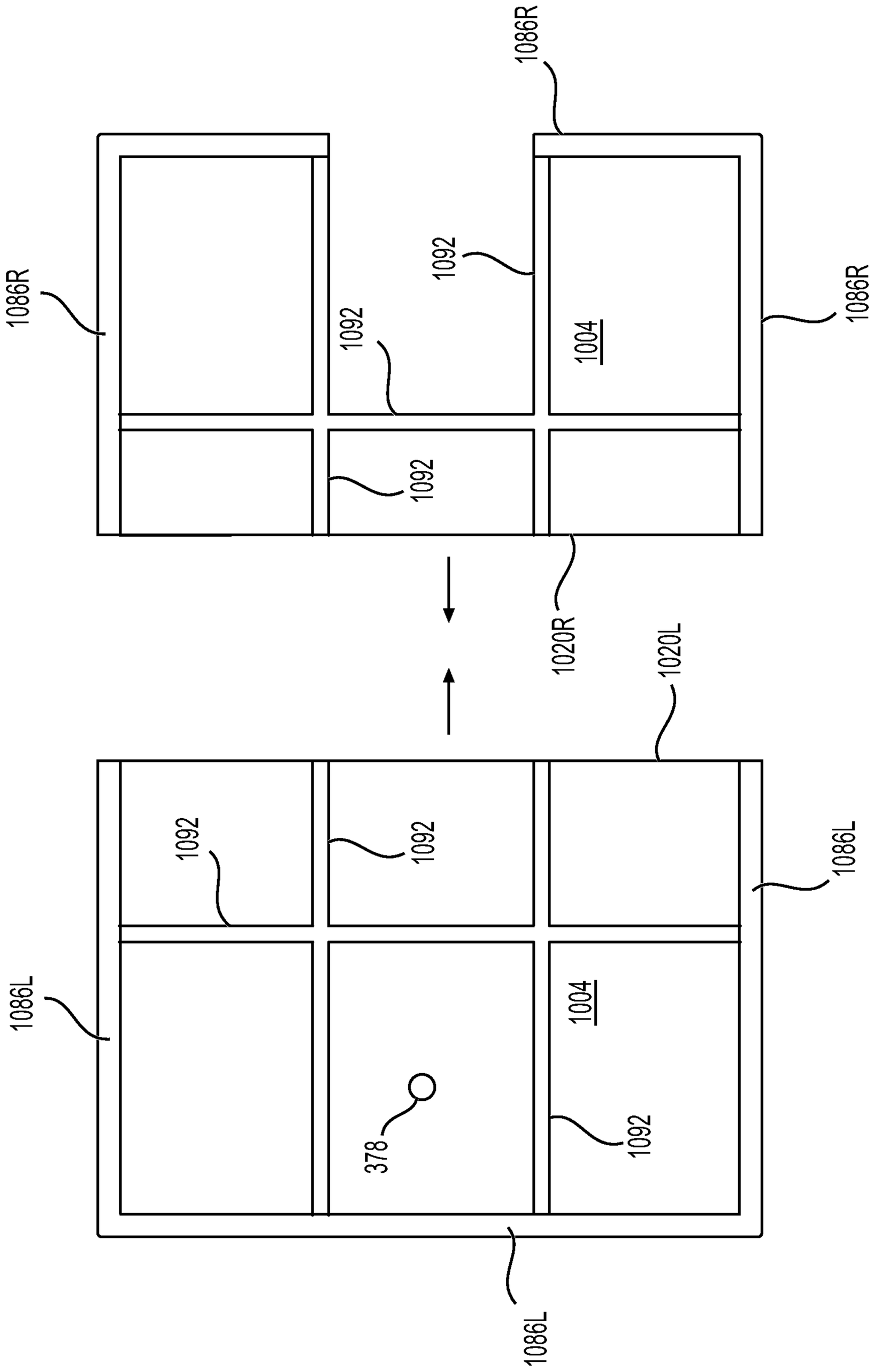

1086R
1086R
1092
1092
1004
1086R
1092
1020R
1020L
1092
1092
1086L
1086L
1004
378
1092
1086L

FIG. 20

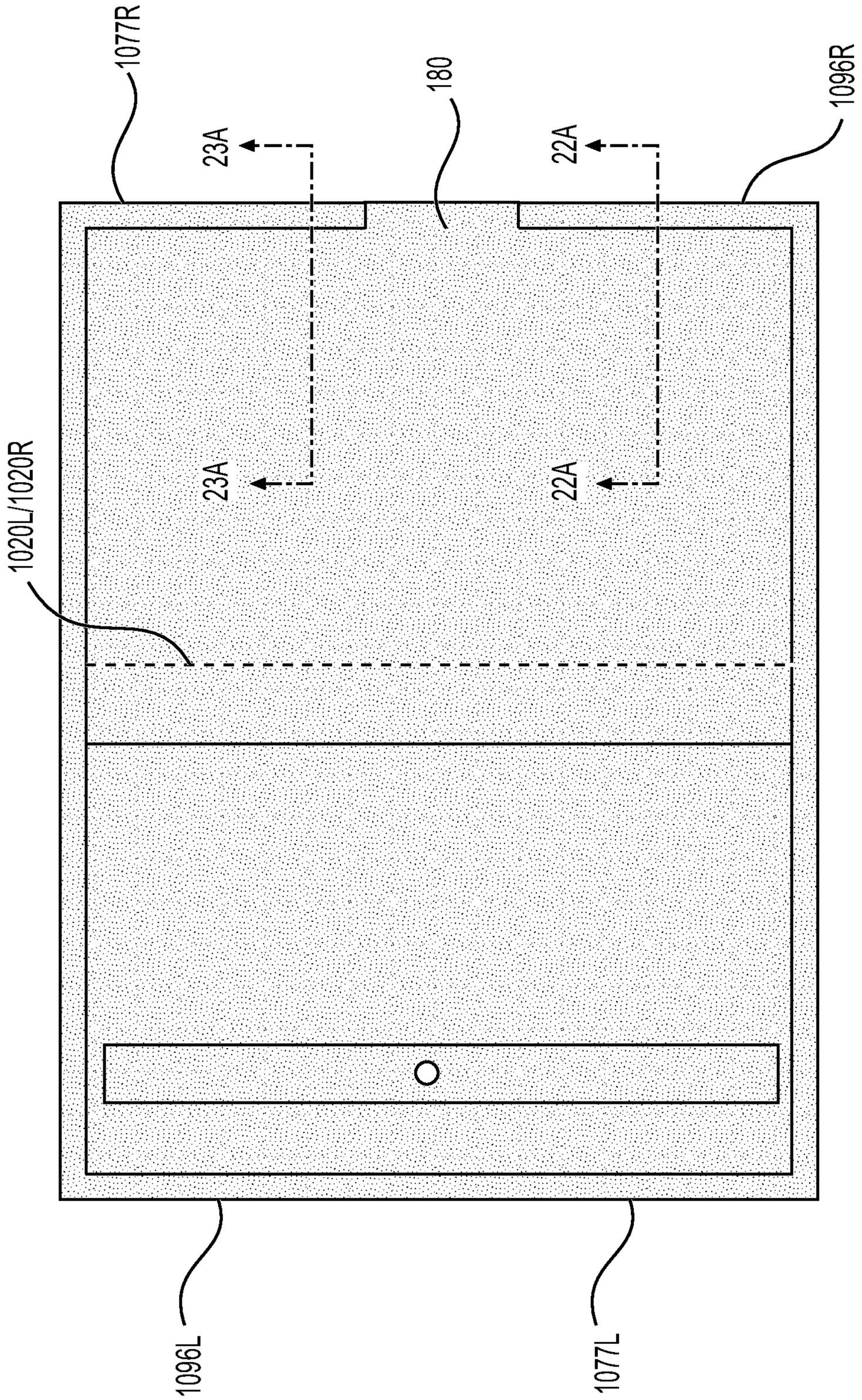


FIG. 21A

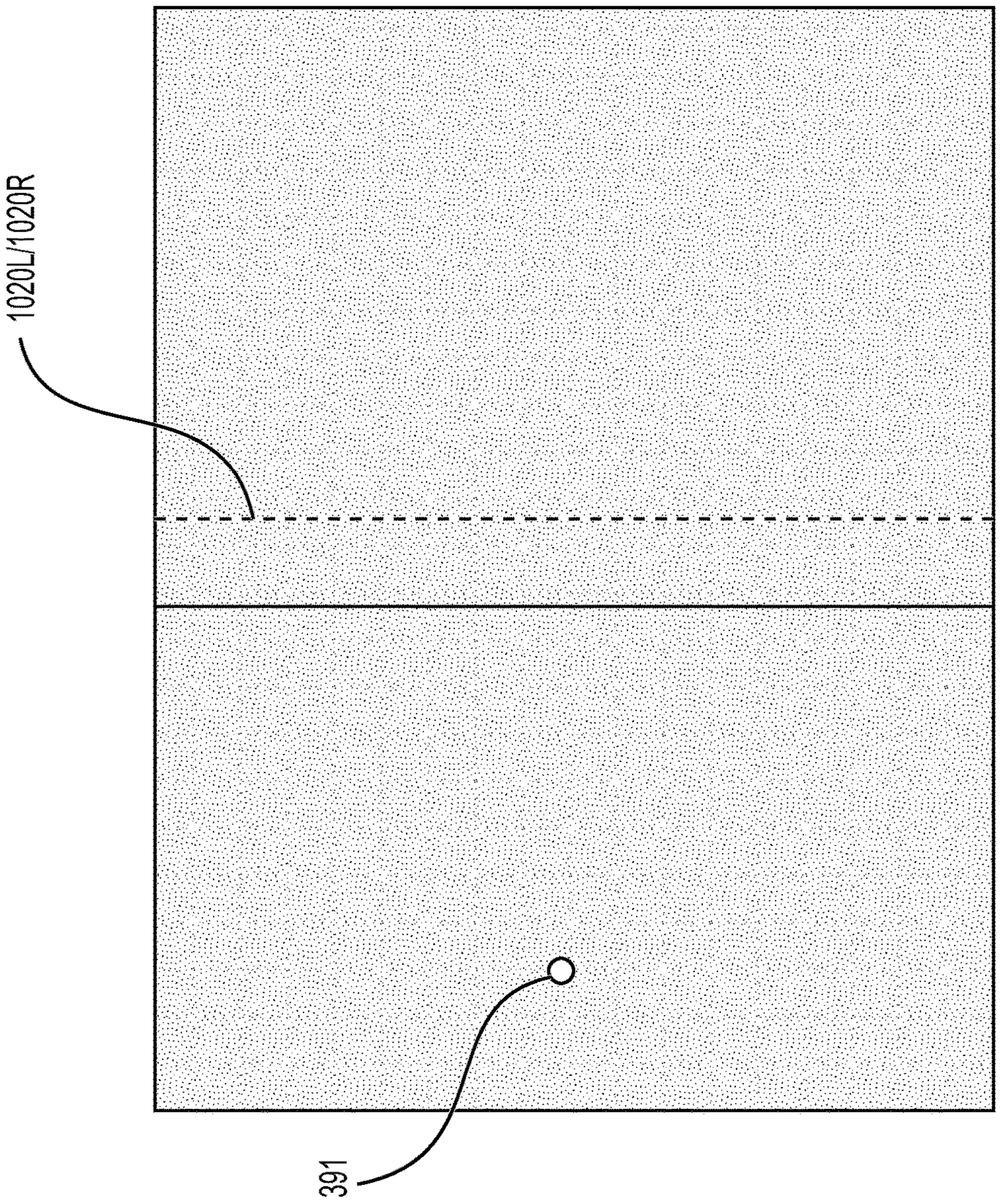


FIG. 21B

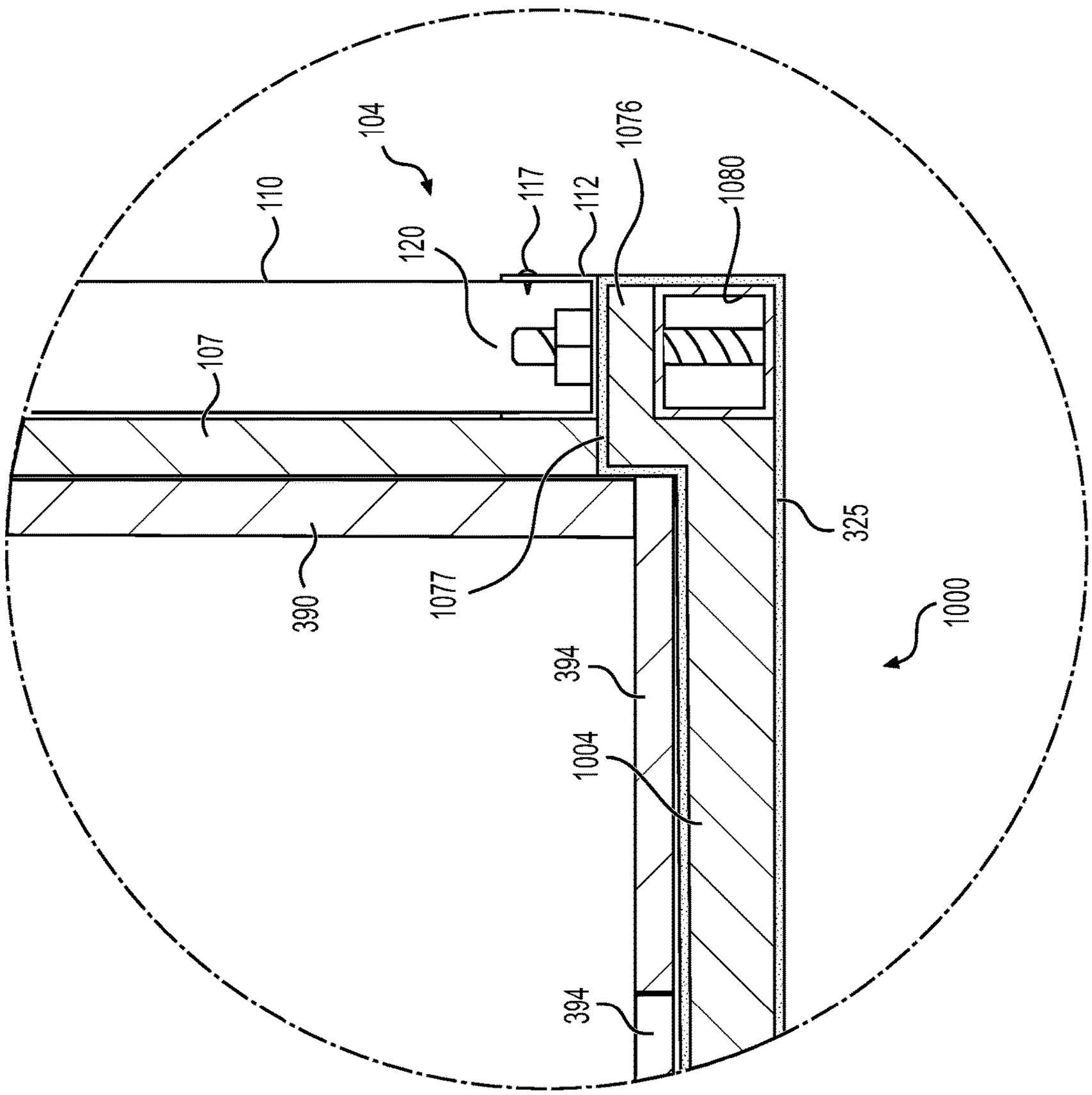

104
1076
110
120
117
112
1080
107
325
390
1077
1000
394
1004
394

FIG. 22A

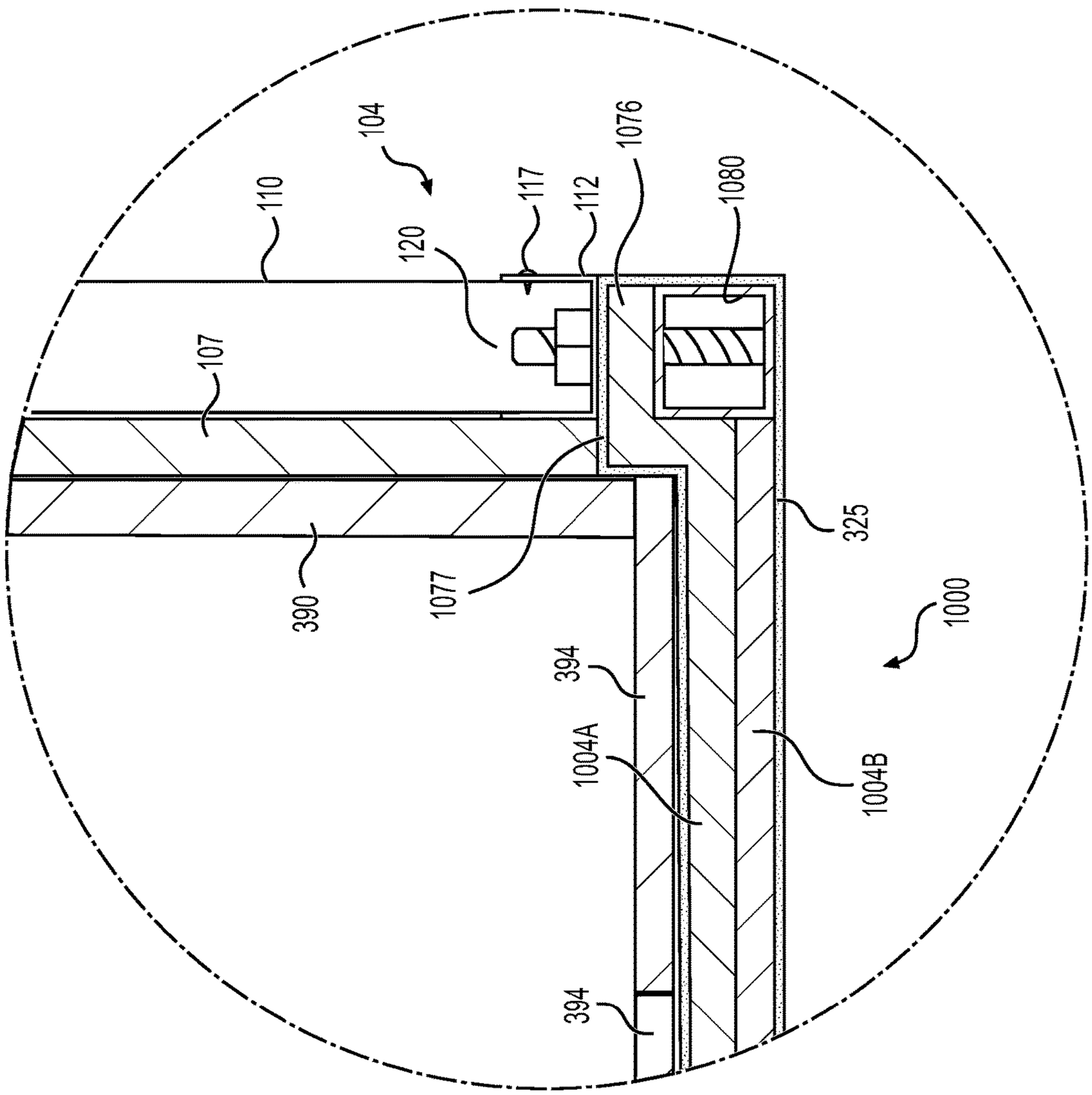
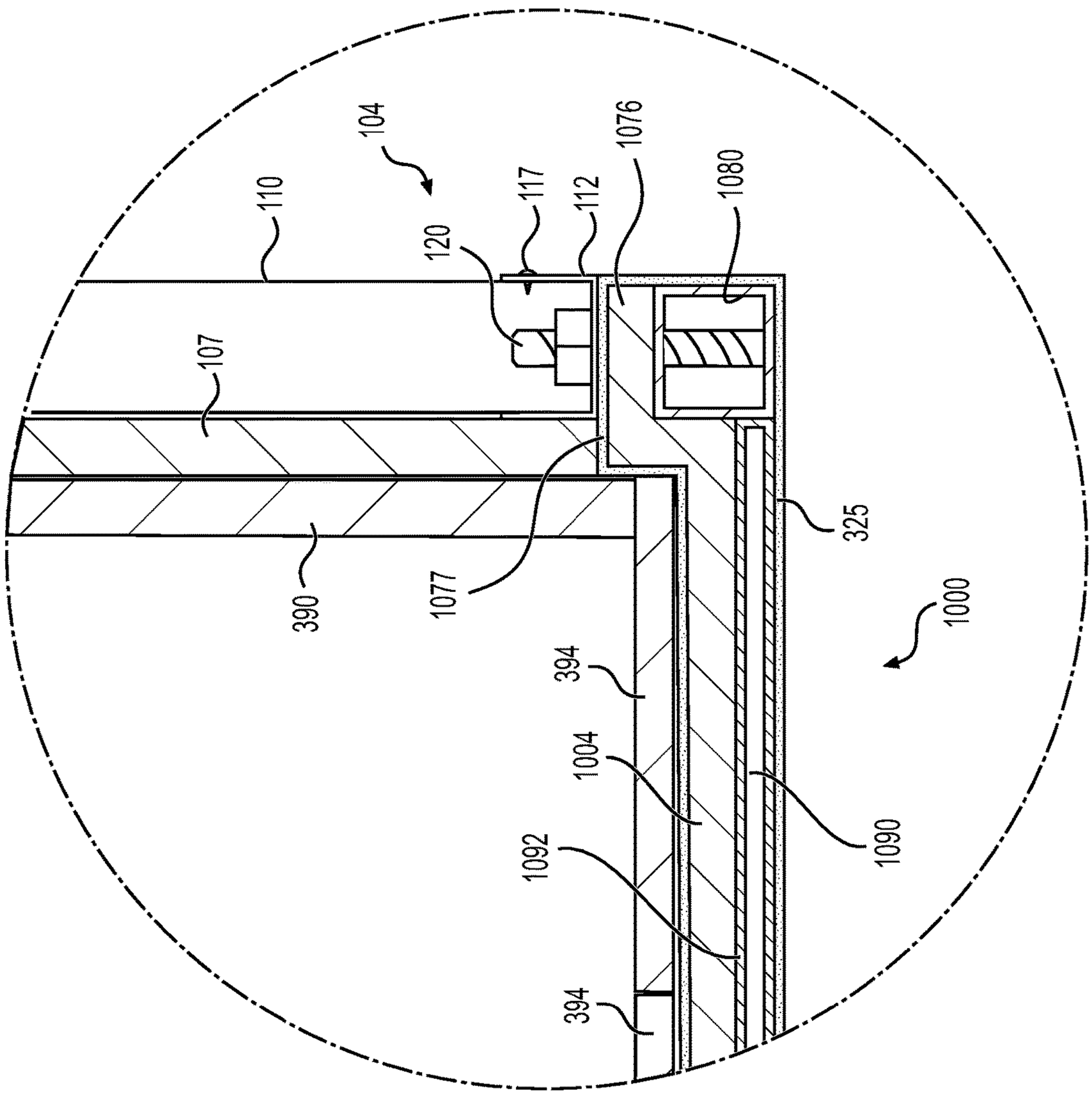

104
1076
110
120
117
112
1080
107
325
390
1077
1000
394
1004A
1004B
394

FIG. 22B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1004
1092
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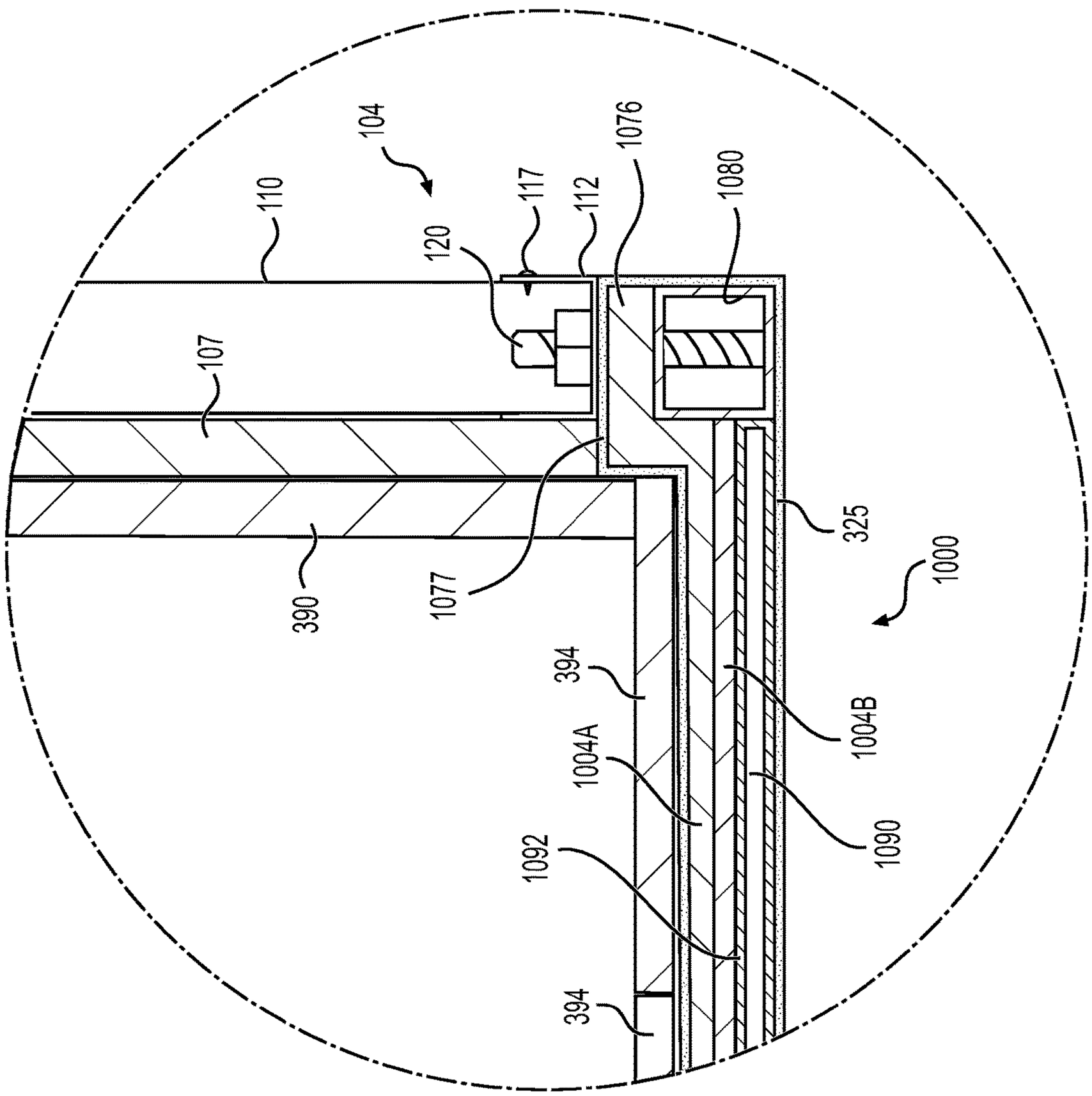
394

FIG. 23A


104
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1004A
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FIG. 23B

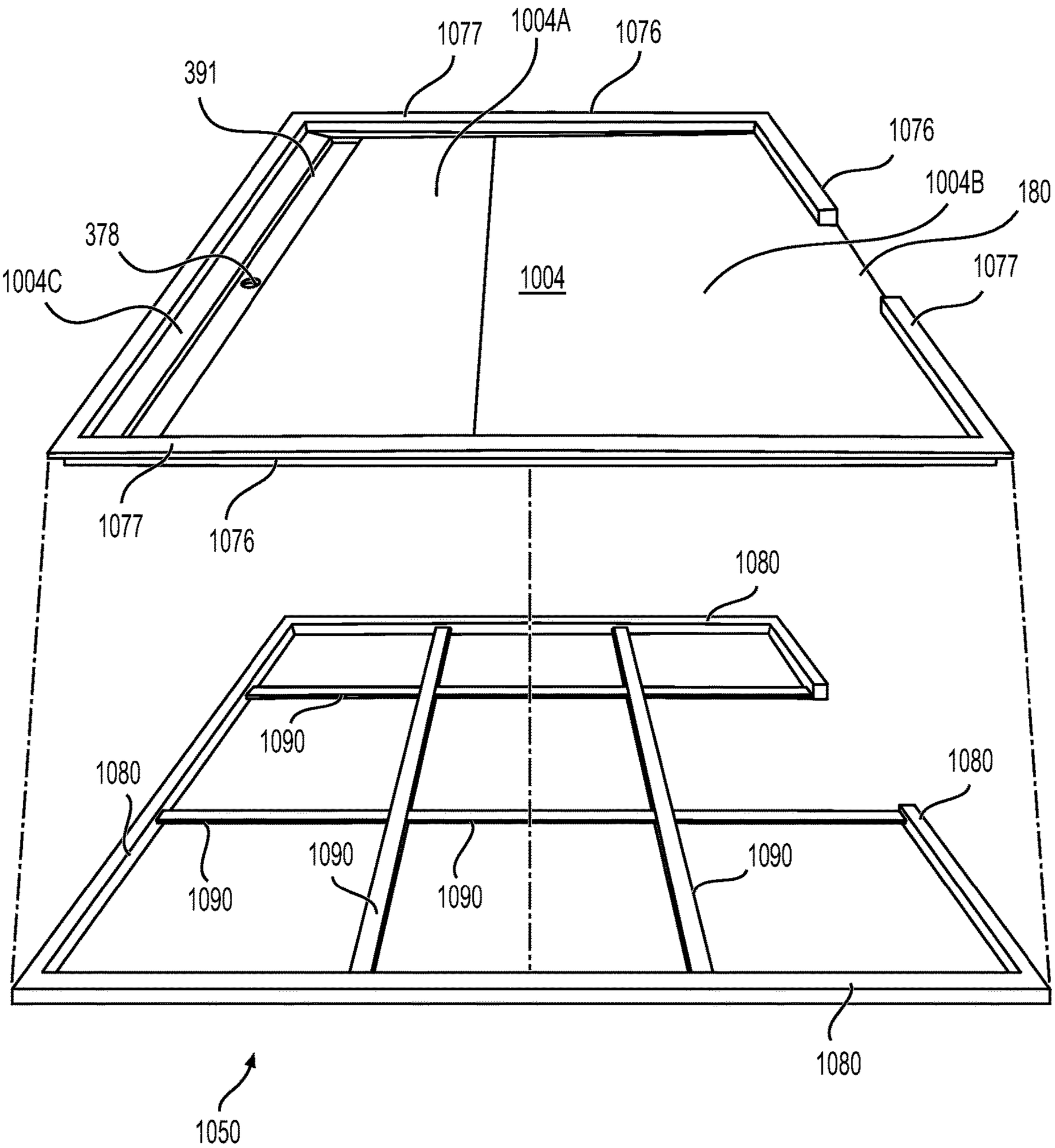
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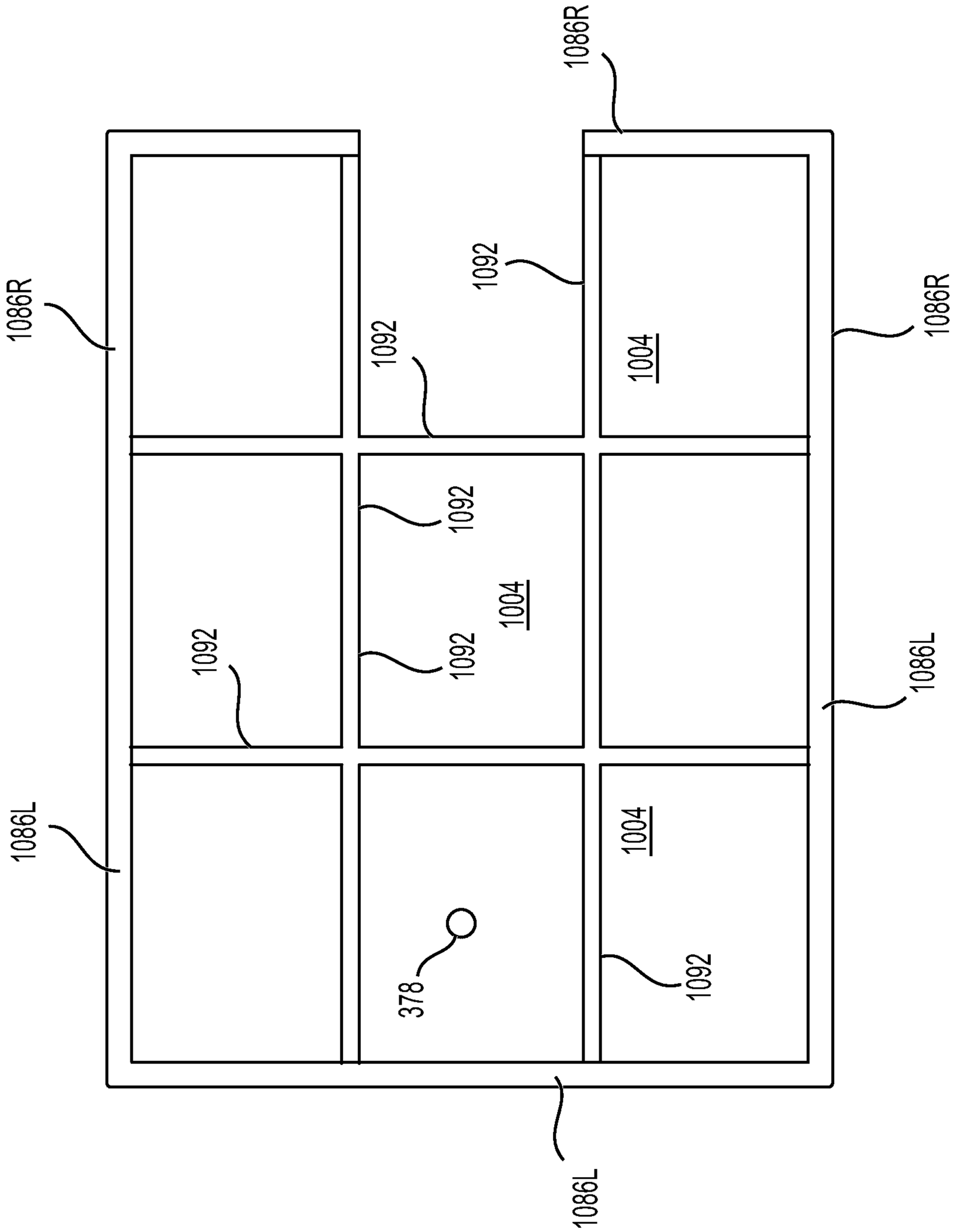
FIG. 24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378

FIG. 25

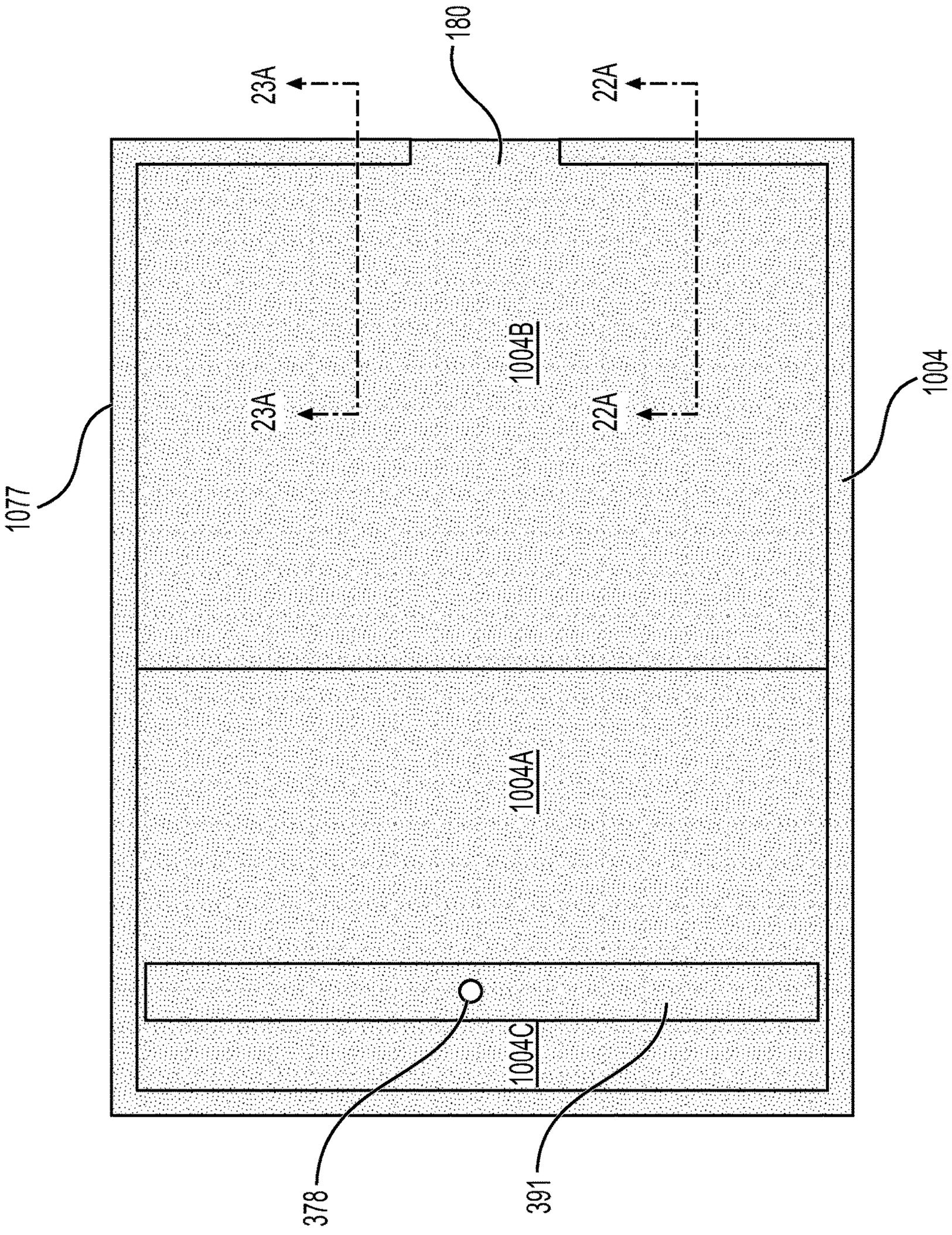

FIG. 26A

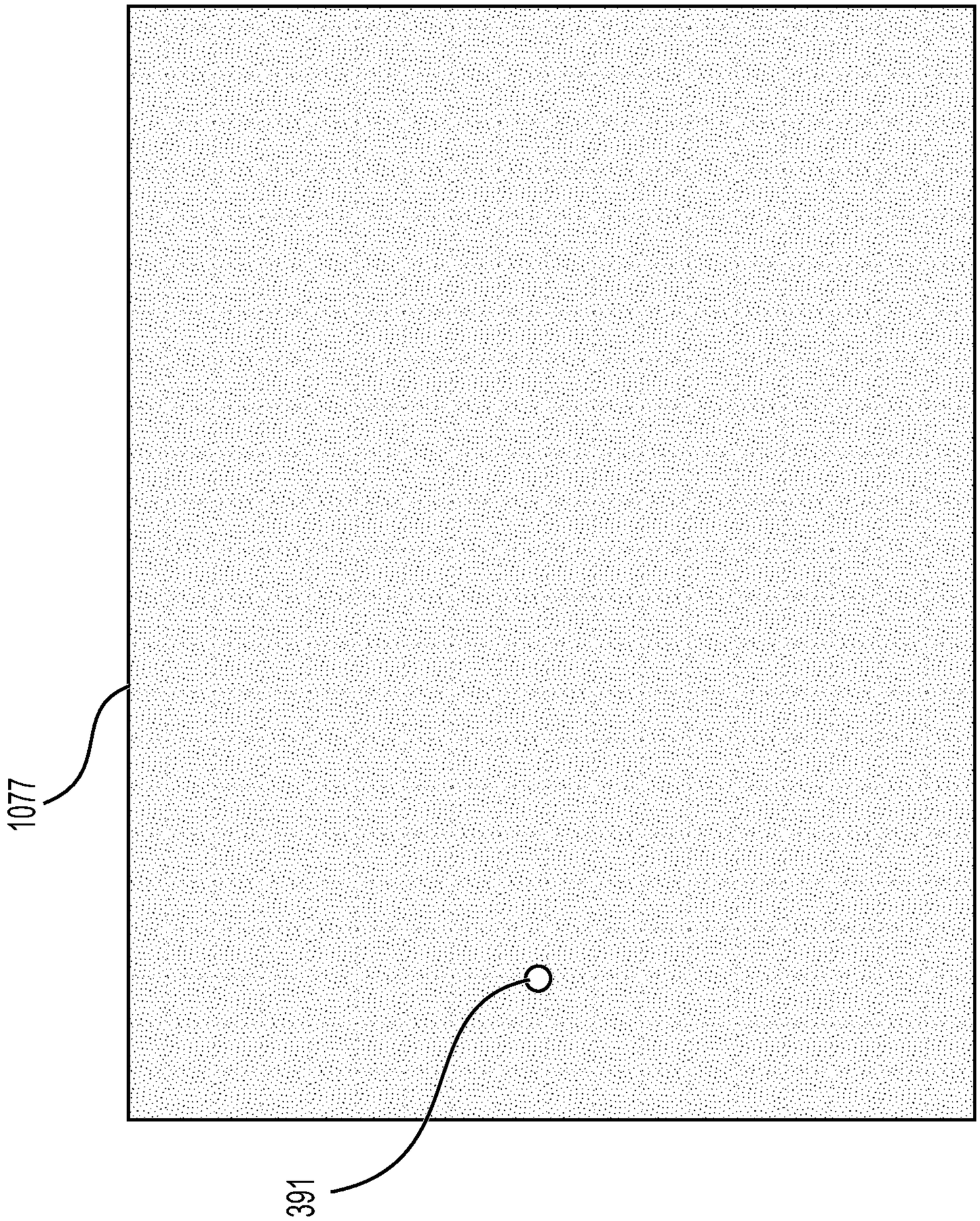

FIG. 26B

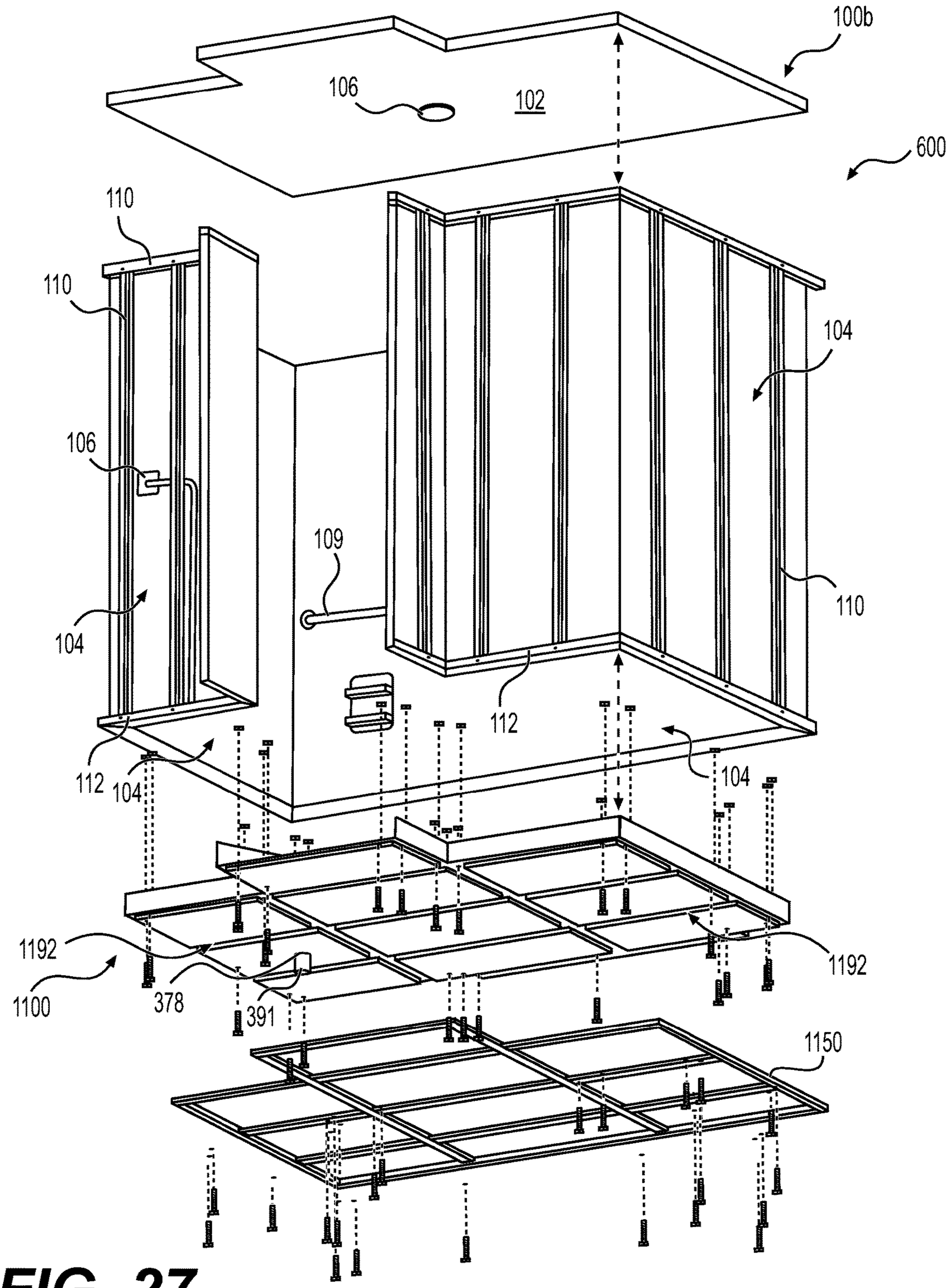
100b
106
102
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FIG. 27

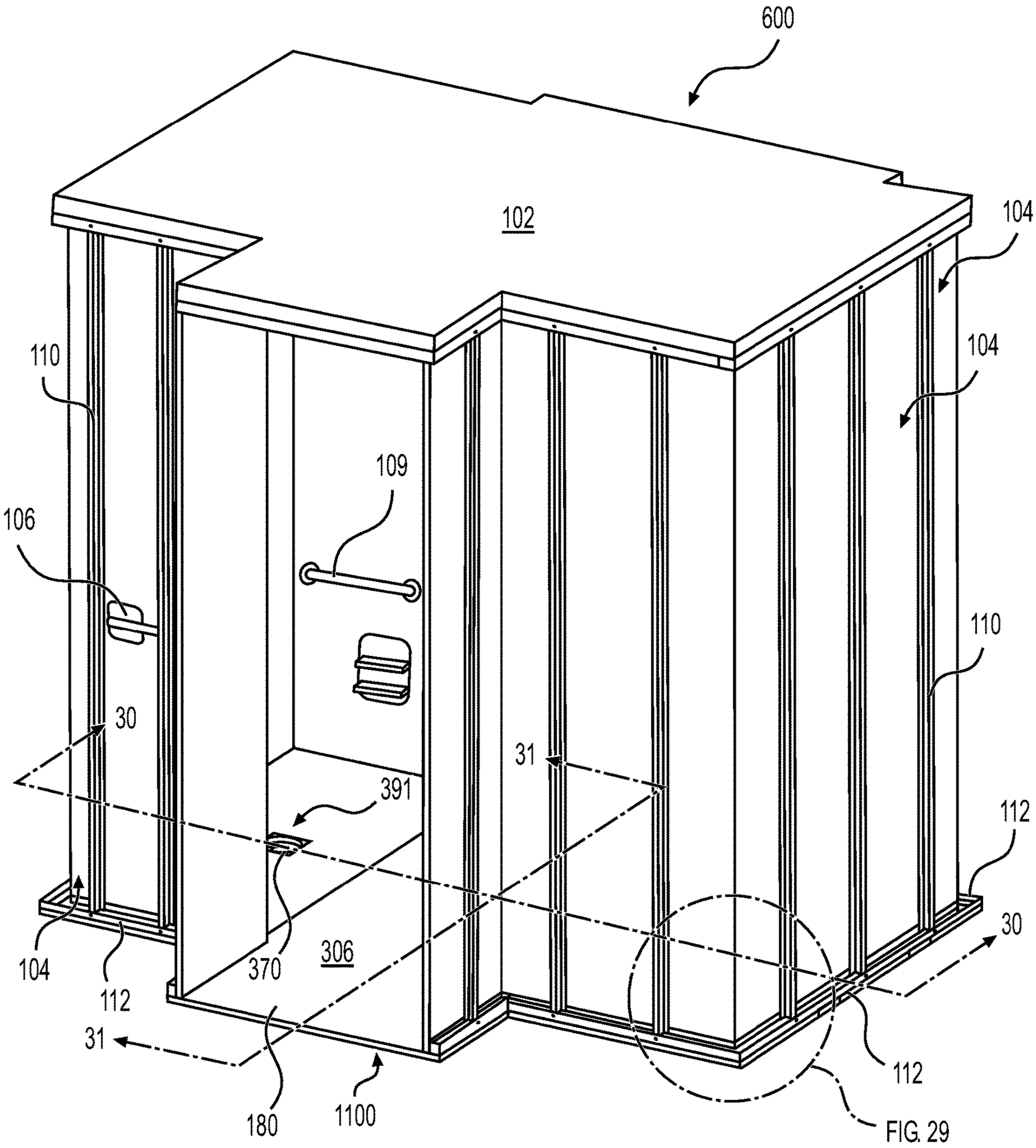
600
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FIG. 29

FIG. 28

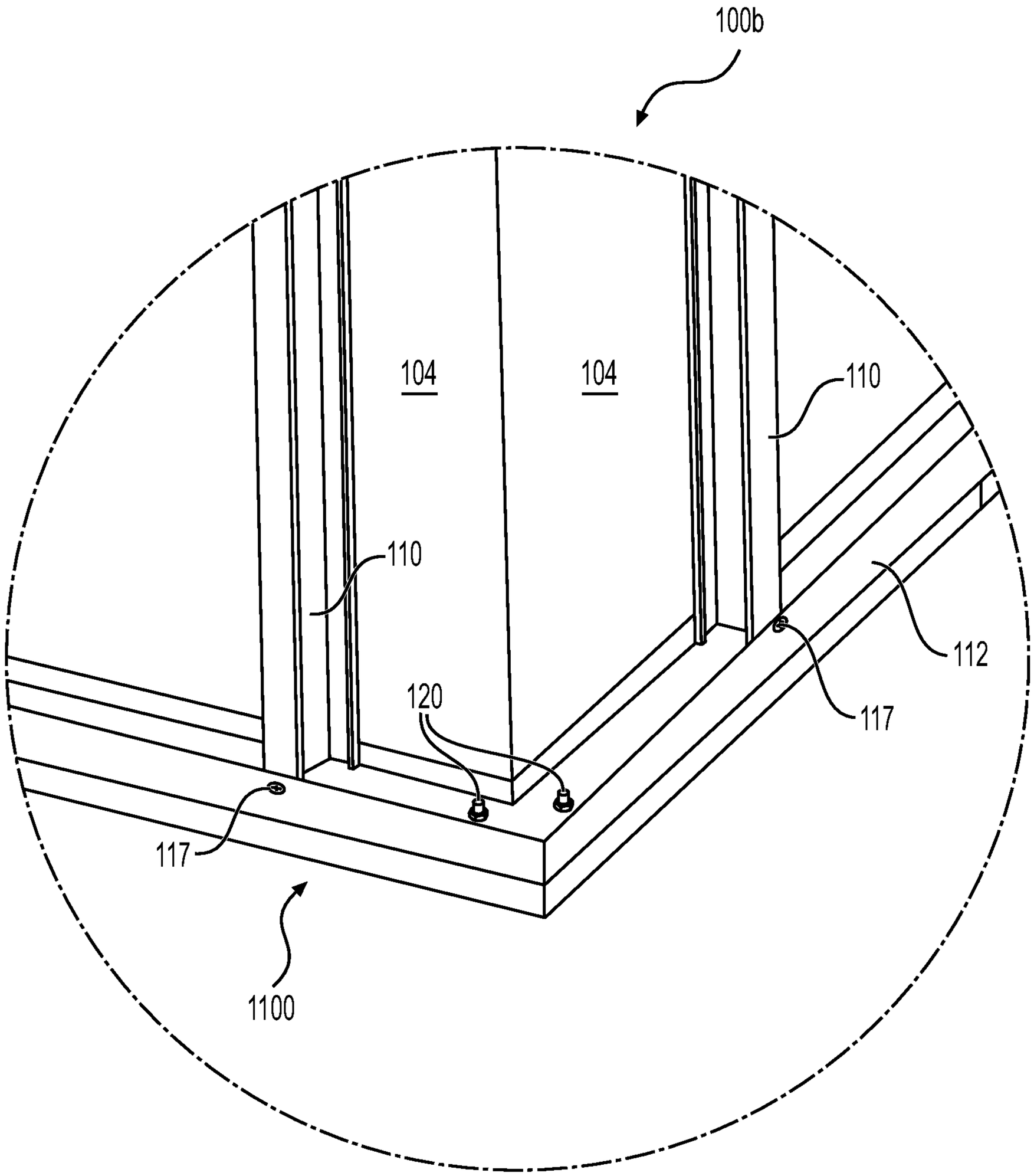

FIG. 29

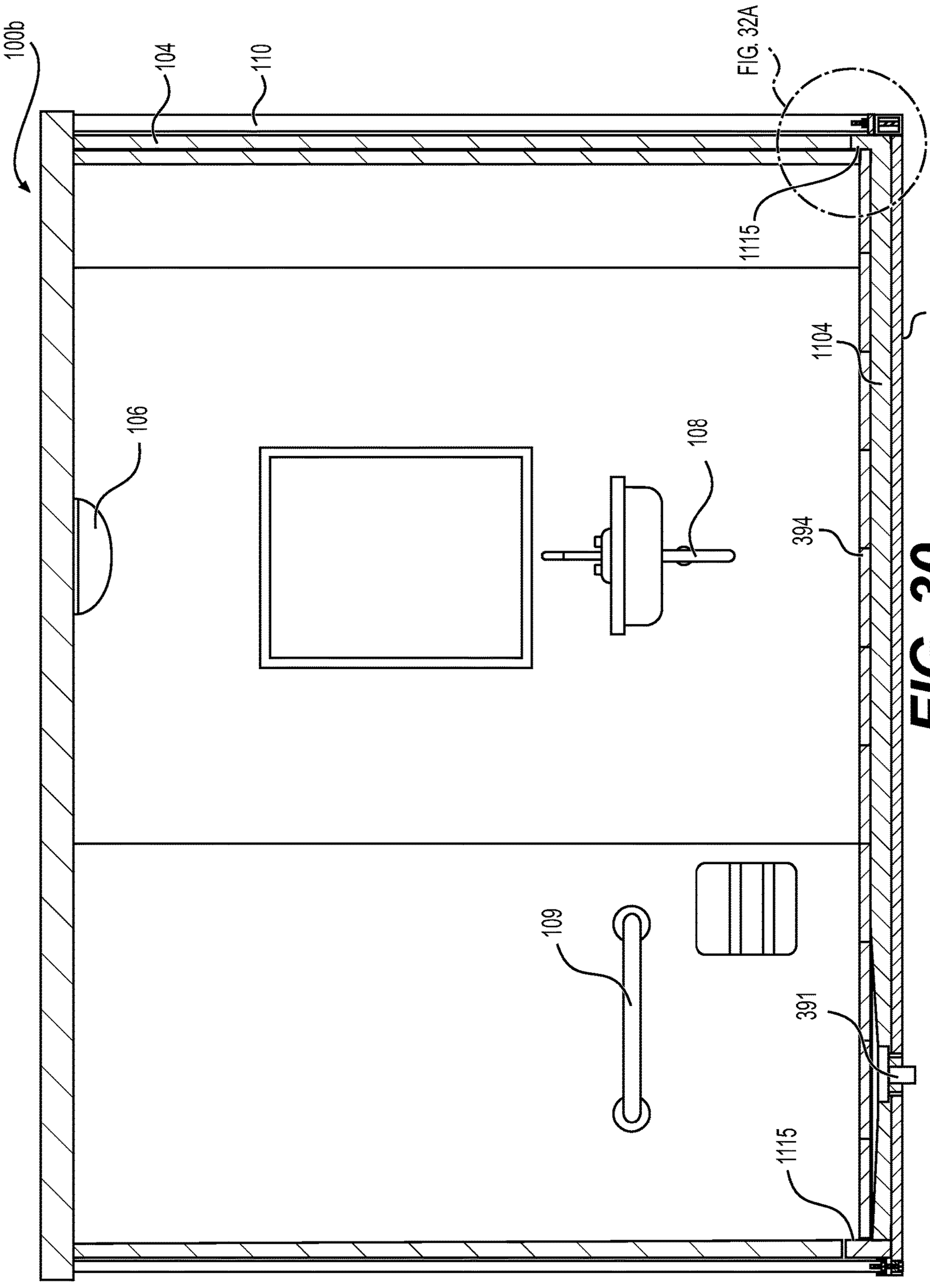

FIG. 30

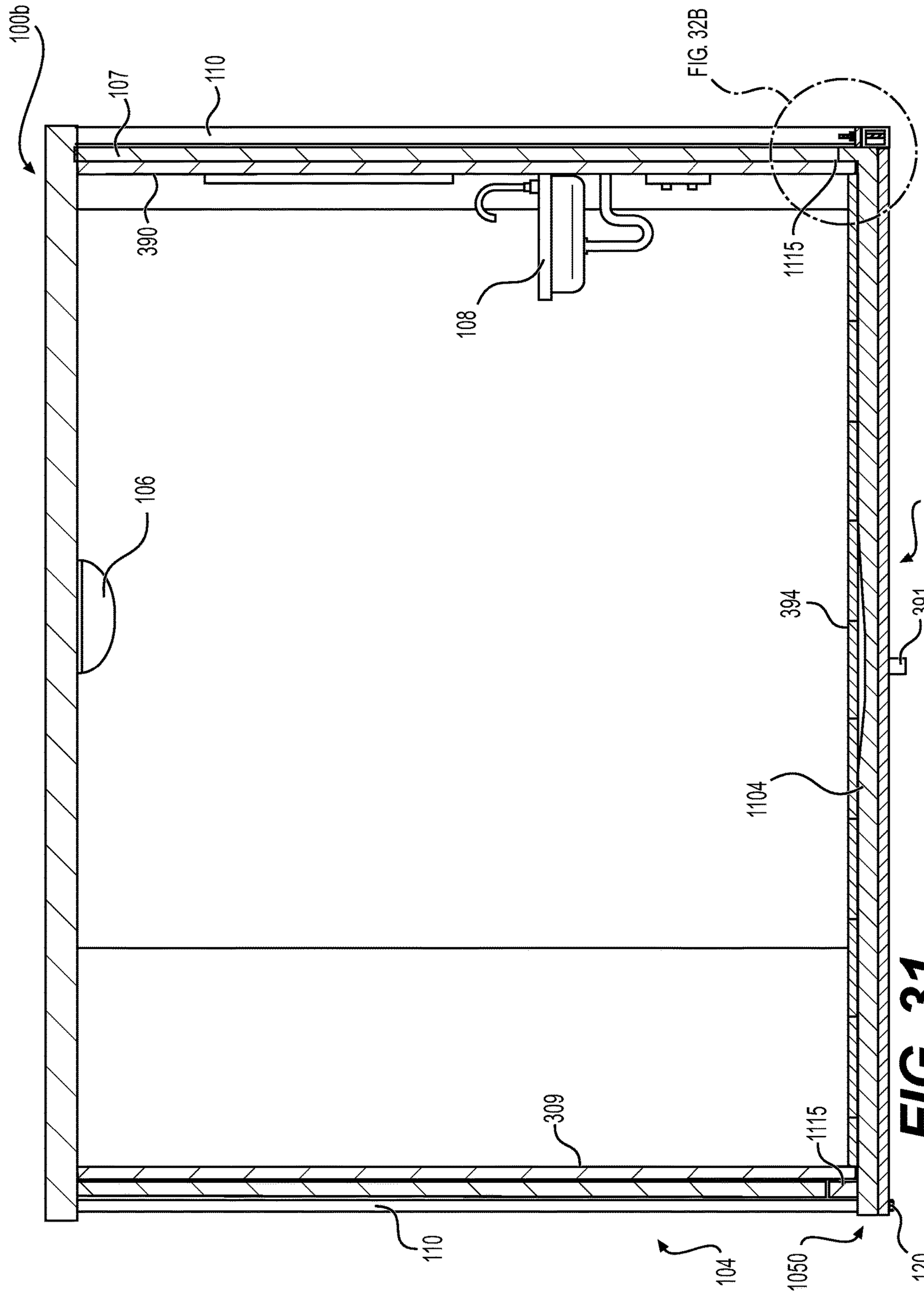
100b
107
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FIG. 32B
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1115
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FIG. 31

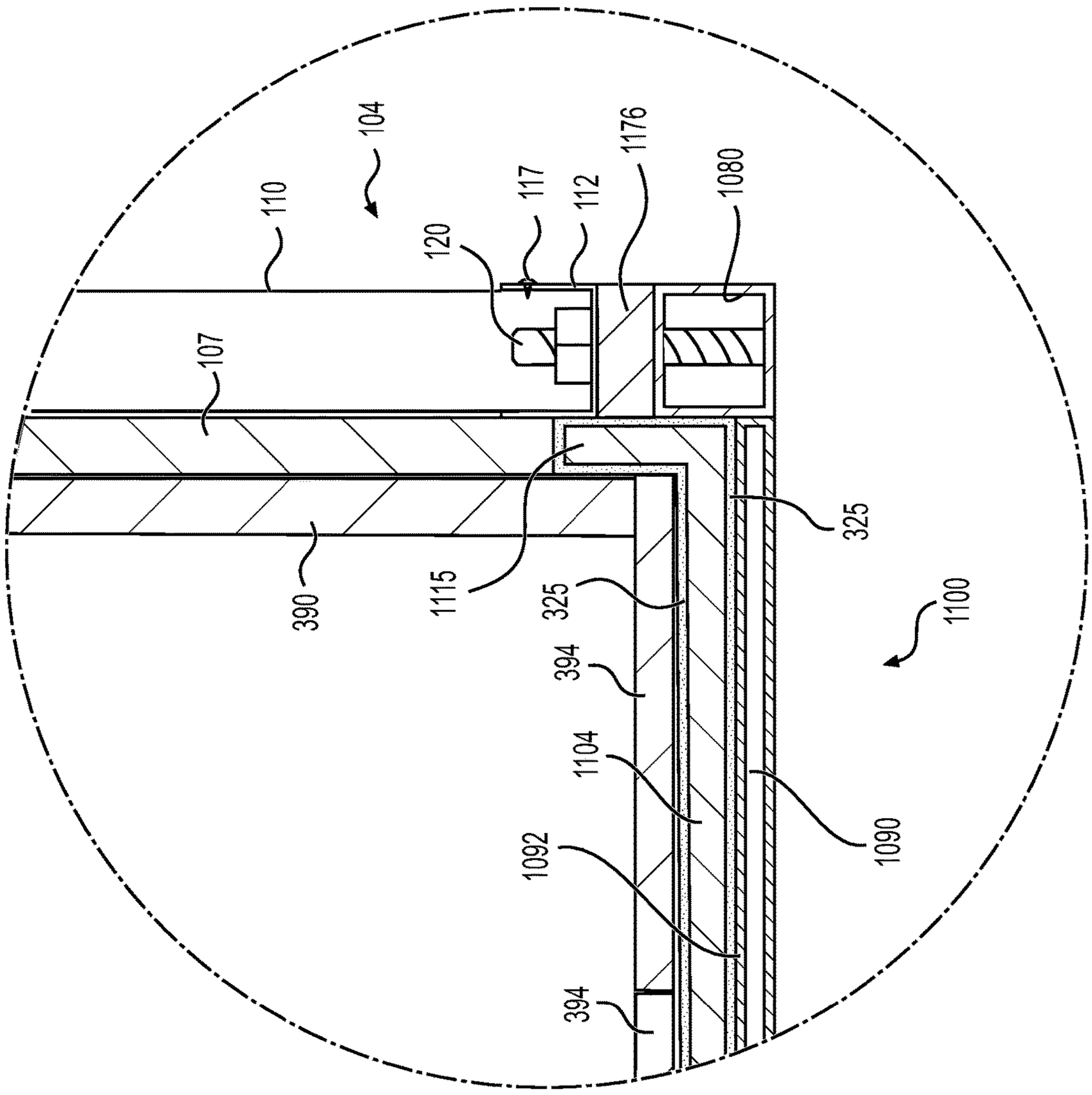
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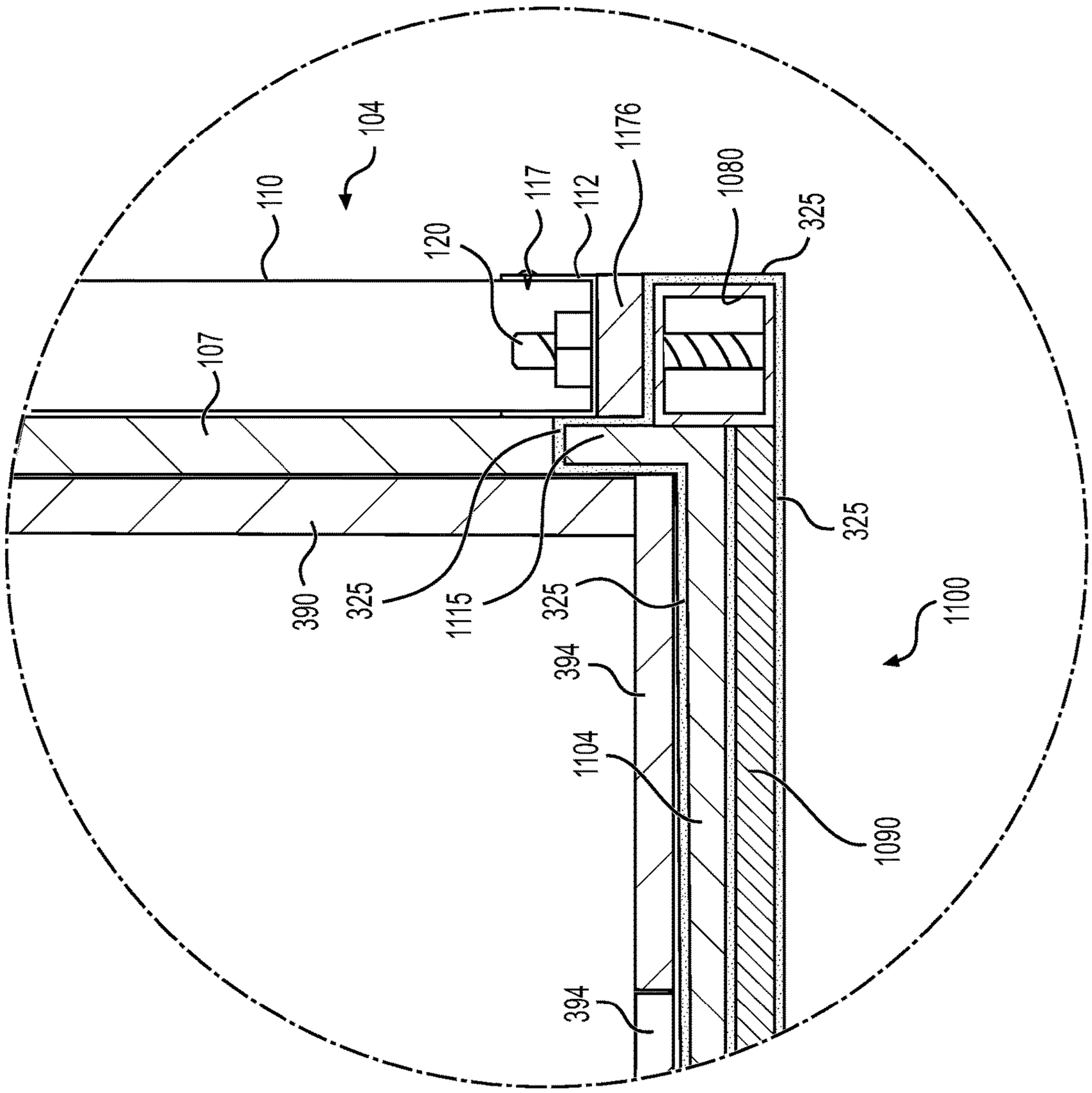
FIG. 32A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325
1115
325
325
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1104
1090
394

FIG. 32B

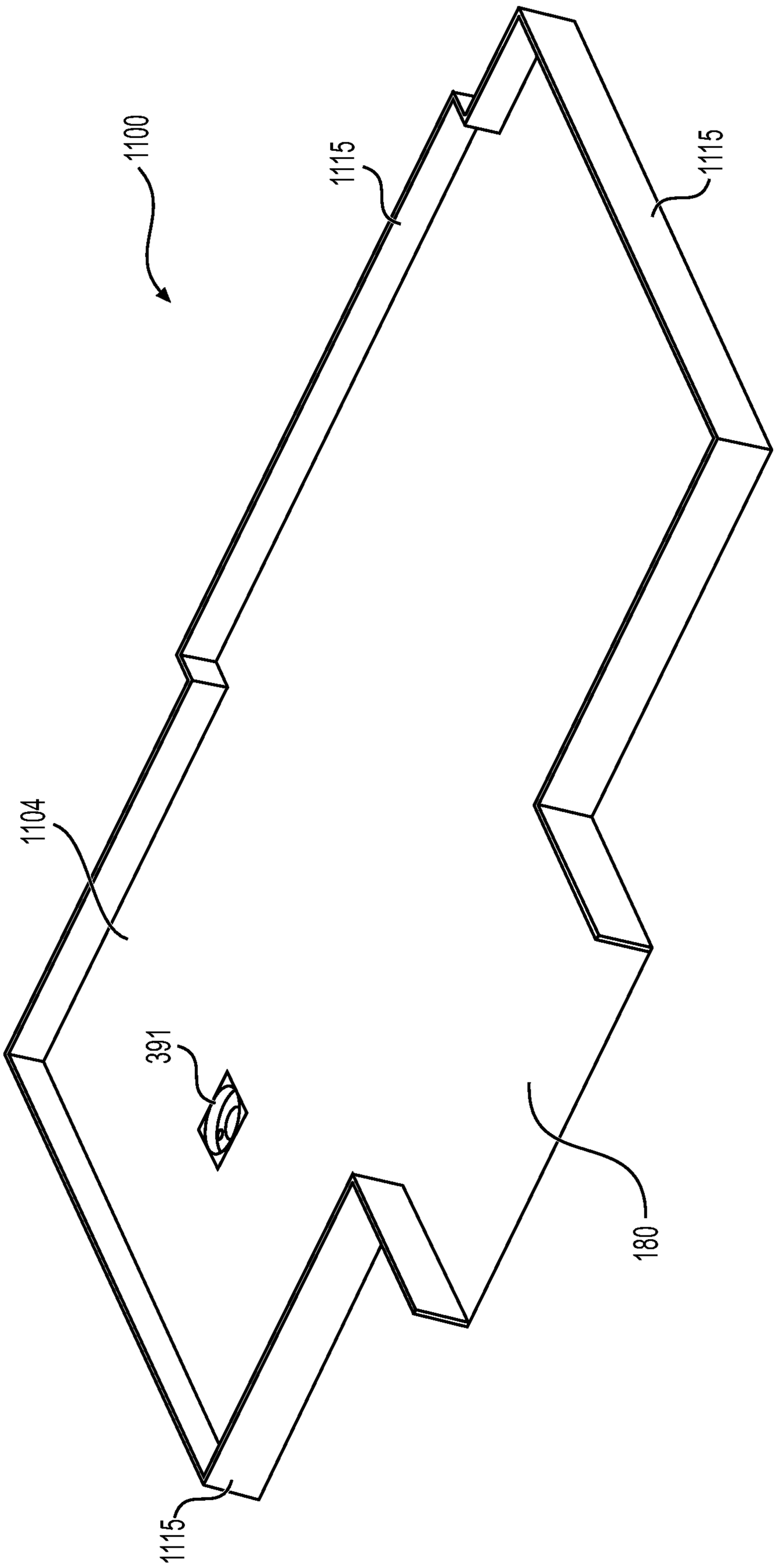

FIG. 33

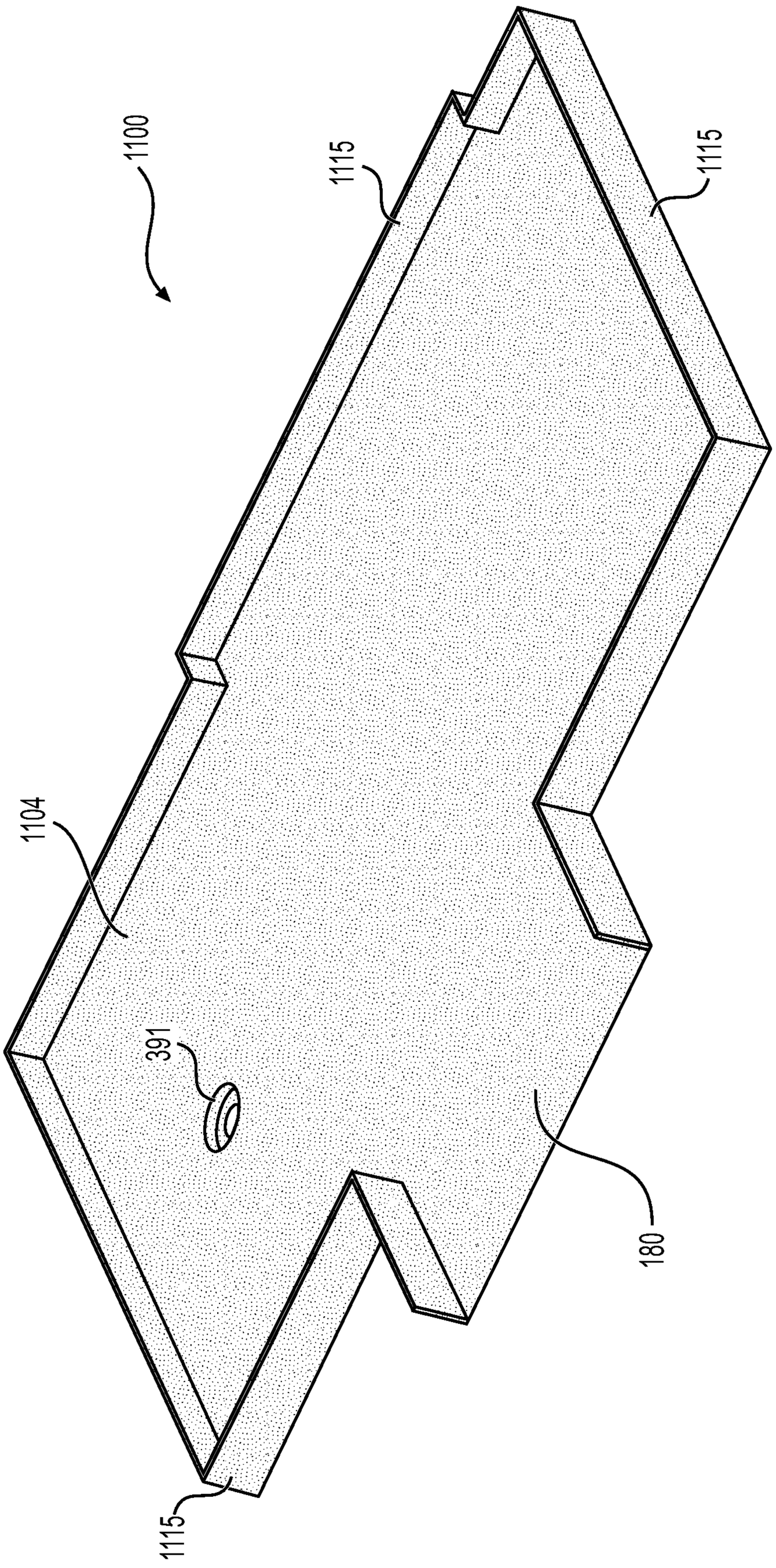

FIG. 34

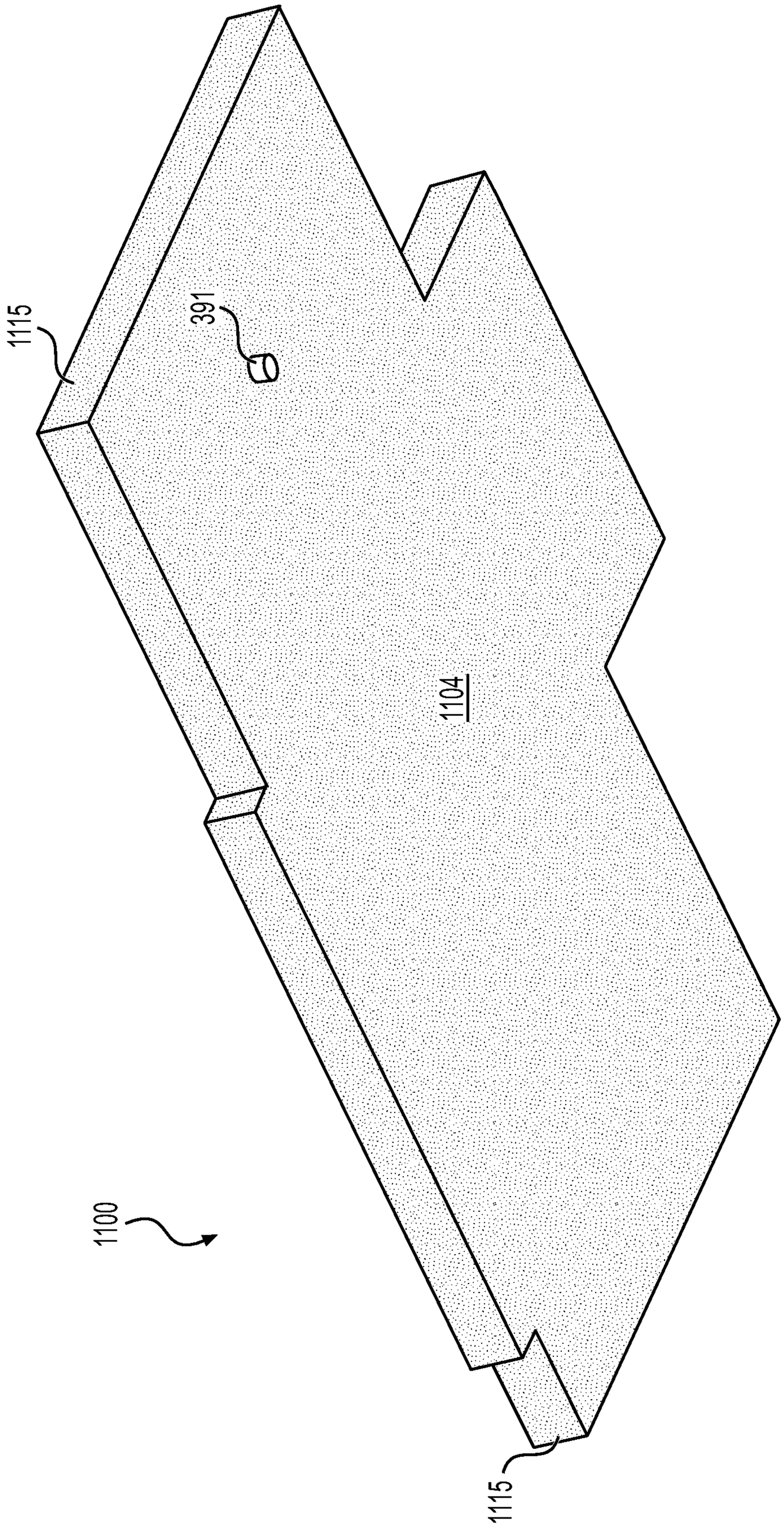

FIG. 35

REINFORCED FLOORS FOR MODULAR BATHROOMS

TECHNICAL FIELD

The present invention relates generally to showers, bathroom floors and other drainable structures that are part of a prefabricated bathroom pod construction or other similar types of modular building units, and more particularly to pod bathroom floors where the pod bathroom floor is reinforced and integrated into the bathroom pod or other building unit in such a manner as to add significant strength to the bathroom pod to resist bending, twisting and sagging, and/or to aid in lifting and supporting the weight of the bathroom pod floors and walls.

BACKGROUND

Most bathroom shower enclosures are created using complicated construction methods. For example, using conventional techniques, a skilled installer frames out the area to be enclosed using two-by-four wooden, steel or aluminum studs to create a shower enclosure space. Felt or tar paper is then laid over a subfloor area enclosed within the space. A flexible, leak-proof liner is installed on top of the felt or tar paper and attached to the frame. Next, the installer attaches dry wall boards to the framing studs, creating shower sidewalls. A hole is cut in the liner to allow for a drain, and a layer of mortar is applied to the shower sidewalls and curb and allowed to cure. Additional mortar is applied on top of the leak-proof liner and hand-shaped to form a shower floor which slopes toward the drain such that water from the shower flows toward the drain. After the mortar has cured, shower tile is applied to the floor and sidewalls to create the finished enclosure.

The process of creating an enclosed shower in this manner is time-consuming and requires experience, knowledge and skill in order to maintain the proper pitch and uniformity in shaping the floor. Irregularities in the pitch of the floor can cause water from the shower not to drain properly or make tiling the shower enclosure difficult. The liners are also susceptible to punctures or leaks and may be difficult for the installer to properly form square corners at the intersection of the shower sidewalls and floor. Additionally, the mortar layer used to create the floor is necessarily thick in order to form a sloped surface, therefore the time required for the floor to cure before applying tile may be quite long (e.g., greater than 24 hours). As a result, construction projects that require a multitude of showers or bathrooms to be fabricated such as residential complexes, hotels, and hospitals will be more expensive and take longer due to the required labor.

In recent years, to decrease this cost especially for the aforementioned commercial applications, the process of shower installation has been vastly improved by the introduction of prefabricated shower bases used for forming the shower floor. Use of these prefabricated shower bases significantly decreases the amount of time and skill required to construct a bathroom shower enclosure, as well as providing more of a consistent and reliable flooring surface upon which to apply floor coverings. These shower bases are pre-constructed molded units having a sloping floor, an integrated drain, curb, sidewalls, and a horizontal surface on the top of each sidewall for receiving drywall such that the drywall surface is substantially flush to the shower base sidewalls. Installation of the shower base involves securing a section of drain pipe to the drain, applying adhesive and sealing material to the sub floor where the base will rest, and

seating the base on the subfloor. Tile can then be applied directly to the shower walls and shower base without the need for first applying mortar.

Other improvements in the construction process have included the provision of entire prefabricated bathroom pods, that are assembled off-site and installed in a building under construction to decrease the cost of labor when building suites in the aforementioned commercial applications.

However, more than just prefabricated shower components are needed to create prefabricated bathroom pods. In particular, there exists a need to make the entire bathroom floor a monolithic and fortified component of such pods that are sturdy enough to withstand the weight and forces exerted on the bathroom floor and other pod components during fabrication, lifting, transport and installation, without fear of damage occurring to the bathroom floor or another part of the prefabricated bathroom pod.

Bathroom pod construction is a new and growing competitive construction segment which has certain advantages over conventional construction methods, particularly in large new built projects. Bathroom pod manufacturers have been successful in eliminating many deficiencies associated with traditional bathroom construction methods undertaken in the field on a construction site by having pod company employees responsible for all or substantially all of the construction and assembly of a pod in a factory setting. When the bathroom pod is finished, it is shipped to a construction site where it is lifted and then installed in the structure as a finished bathroom.

The factory environment allows significantly more oversight and control over how and when a pod is manufactured, including sequencing different groups of pod employees based upon when their trade expertise is required. Pod supervisors are also readily available to oversee real time work quality, sequencing and scheduling.

With all employees working for the pod manufacturer, the pod employees avoid many of the friction occurring on a traditional construction site between and among different trades present in traditional construction, including, among other things, one trade intentionally or recklessly negatively impacting finished work of another trade.

Bathroom pod manufacturers have introduced meaningful innovation in the construction of bathrooms. However, that innovation has not, for the most part, trickled down to the construction of pod bathroom floor components. Currently, portions of the pod bathroom floor are still being manufactured in much the same way that bathroom floors have been manufactured for years in conventional construction. Bathroom pods are still installed with basic substrates on which pod floors are assembled and installed using a series of off-the-shelf bathroom products which basically mimics traditional (i.e., non-modular) construction practices. Consequently, pod bathroom floors share many of the same headaches and drawbacks associated with traditional construction, along with several additional meaningful drawbacks that are uniquely attributable to pod construction. For example, since pods are manufactured in a factory, they must be shipped from the factory to the construction site and then placed on substrates in buildings with any number of stories. Heretofore, the interconnections between bathroom pod floors and the walls of the pod have not employed independent weight bearing substrates or anti-torsional features which prevent pod floors and/or walls from twisting, bending, sagging and/or otherwise potentially compromising the installed floor and wall coverings, causing them to loosen or

dislodge from the pod floor and/or walls when the completed pod is installed on a traditional construction site substrate.

SUMMARY OF THE DISCLOSURE

With the introduction of the herein disclosed new reinforced pod bathroom floor systems, the bathroom pod industry will now have a one-piece pod flooring system which will revolutionize how the bathroom pod industry manufactures bathroom pod floors. Most importantly, the one-piece pod bathroom floor systems provide a full menu of custom solutions for the bathroom pod industry which are not otherwise available and will save significant time and cost. The inventions set forth in this application address many of the thorny issues currently plaguing the bathroom pod manufacturers related to the bathroom pod component. Specifically, the pod bathroom floor component described herein not only provides one or more bathroom shower floors, it also provides all the other bathroom floor structures which include but are not limited to one or more flat bathroom areas, one or more non-shower pitched bathroom wet areas, one or more dry pitched bathroom areas, the entrance to the bathroom, along with any custom size bathroom floor component required, while also having the pod bathroom floor entrance component fit into a shallow substrate slab recess (for example, 1.5"), thereby avoiding the excessive costs of recessing the slab even more. Most importantly, all of the above is contained in a one-piece bathroom floor component, which has adequate independent weight bearing floor capabilities as well as being resistant to sagging, bending, twisting and other deformations, and in some embodiments also has pod wall weight bearing capabilities, so the bathroom pod manufacturer can order and receive a one piece pod bathroom floor component which can be assembled with the pod wall panels in a very short period of time (e.g., less than 45 minutes).

A prefabricated bathroom pod according to an embodiment of the present disclosure may comprise a plurality of wall studs supporting wall panels, a ceiling structure, electrical wiring, plumbing (as well as associated accessories), and a bathroom floor component including one or more plastic and/or foam members, the bathroom floor component being characterized as being encapsulated in a waterproof covering or membrane. The walls may connect the ceiling to the bathroom floor component, the electrical wiring may be attached to at least one of the plurality of walls and/or the ceiling, and the plumbing may be attached to at least one of the plurality of walls and/or the bathroom floor component. Thereafter, wall coverings and floor coverings may be applied to the bathroom pod walls and floor.

A prefabricated bathroom pod according to another embodiment of the present disclosure may comprise a plurality of wall studs supporting wall panels, a ceiling structure, electrical wiring, plumbing (as well as associated accessories, if any), and a bathroom floor component including at least a first elongated frame member that is adhered to one or more plastic or foam floor members, the bathroom floor component being characterized as being either encapsulated in a waterproof covering or membrane or comprising one or more closed cell floor panels which are not encapsulated in a waterproof covering The walls may connect the ceiling to the bathroom floor component, the electrical wiring may be attached to at least one of the plurality of walls and/or the ceiling, and the plumbing may be attached to at least one of the plurality of walls and/or the bathroom floor component. Thereafter, wall coverings and floor coverings may be applied to the bathroom pod walls and floor.

A bathroom floor component according to an embodiment of the present disclosure may comprise one or more floor edge strengthening peripheral members, one or more cross-brace trasverse floor strengthening members, and one or more plastic and/or foam members. The one or more edge floor strengthening peripheral members may be joined to the one or more cross-brace trasverse floor strengthening members, defining one or more pockets, and at least one of the plurality of foam and plastic materials members may be disposed in each of the one or more pockets.

A method of fabricating and using a bathroom floor component according to an embodiment of the present disclosure may comprise positioning one or more foam and/or plastic members that are spaced apart from each other, creating a peripheral framework that may include a plurality of floor edge strengthening members forming an enclosed perimeter around all of the one or more foam and/or plastic floor members, providing a plurality of cross-brace transverse floor strengthening members between the two or more foam and/or plastic floor members, and attaching each of the one or more foam and/or plastic floor members to at least one of the plurality of edge peripheral members, and/or to at least one of the plurality of cross-brace transverse strengthening members.

A prefabricated bathroom pod according to another embodiment of the present disclosure may comprise a ceiling, a floor component, a plurality of walls, electrical wiring and plumbing accessories. An improvement for such a bathroom pod may comprise a bathroom floor component including a perimeter raised platform strengthening member, which defines one or more of a planar upper surface and planar lower surface, defining an outer perimeter of the bathroom floor component, and a foam and/or plastic floor member surrounded by the perimeter peripheral member. The foam and/or plastic floor member may define a drain aperture, and at least a first top surface all or a portion of which is sloped toward the drain aperture. The foam and/or plastic floor member may be a single monolithic member or may be comprised of a plurality of separate floor members, which may or may not be separated by, and attached to, one or more cross-brace transverse strengthening members. In embodiments, the perimeter raised platform strengthening member may be adapted to strengthen the floor component and attach to and support the plurality of bathroom pod walls.

In embodiments, an improvement to this arrangement may include one or more of a rectangular wall frame member and a U-shaped channel forming a lower edge of the bathroom walls, with both the U-shaped channel and the rectangular shaped frame member sized and shaped to mate with the planar upper surface of the raised platform strengthening member, and one or more fasteners adapted to pass through the raised platform strengthening member and one or more of the U-shaped channel and the wall frame member to connect the floor component to the walls of the pod. The raised platform can be substantially the same width as the wall studs **110**, or substantially the same width as the wall studs **110** with shower board attached to it, or narrower or wider than both of these two widths, based on the customer needs or other design criteria.

In other embodiments, an improvement to this arrangement may include one or more of a rectangular wall frame member and a U-shaped channel forming a lower edge of the bathroom walls, with both the U-shaped channel and the rectangular shaped frame member sized and shaped to mate with the planar upper surface of the raised platform strengthening member, where wallboard (e.g., sheet rock) is asso-

ciated with the pod walls, the width of the planar upper surface of the raised platform strengthening member being at least as wide as the combined widths of the wallboard and the U-shaped channel or the rectangular shaped frame member, and further comprising one or more fasteners adapted to pass through the raised platform strengthening member and one or more of the U-shaped channel and the wall frame member to connect the floor component to the walls of the pod.

In still other embodiments, an improvement to this arrangement may include one or more transverse bars, straps or metal frames associated with the bottom side of the bathroom floor component. The transverse bars, straps or metal frame may define one or more apertures adapted to align with corresponding apertures defined by said perimeter raised platform strengthening member, said one or more fasteners adapted to pass through the apertures in the strengthening bars/straps/metal frame, said raised platform strengthening member and the one or more of the U-shaped channel and the wall frame member to connect the floor component to the walls of the pod.

A bathroom floor component according to another embodiment of the present disclosure may comprise one or more foam and/or plastic floor members, a raised platform strengthening member including a top planar surface, the raised platform strengthening member at least partially surrounding the one or more foam and/or plastic floor members, an outer wall of the raised platform strengthening member defining an outer perimeter of the bathroom floor component, the raised platform strengthening member also defining an inner wall and a bottom surface. A strengthening border member may be disposed between the one or more foam and/or plastic floor members and the raised platform strengthening member. The one or more foam and/or plastic floor members may define a drain aperture and include at least a first top surface all or a portion of which slopes toward the drain aperture.

In embodiments, the raised platform strengthening member is reinforced by weight-bearing, anti-compression elements. In embodiments, the floor panels may consist of a single, closed cell panel as the only floor panel for the bathroom floor component. In embodiments, such single closed cell panel may also be the only panel used with a raised pod wall support platform.

A method of fabricating and using a bathroom floor component according to yet another embodiment of the present disclosure may comprise machining a foam and/or plastic floor member having at least one sloped surface extending downwardly toward a drain aperture, further machining from the same piece of foam and/or plastic a raised platform strengthening member at least partially surrounding the floor member, the raised platform strengthening member adapted to be placed in registry with the pod walls to at least partially support the weight of the pod walls. The raised platform strengthening member may be provided with apertures suited to receiving fasteners to connect the bathroom floor component to lower ends of the pod walls. The method of fabricating in this embodiment comprises encapsulating the entirety of the bathroom floor component in a waterproof layer.

A method of fabricating and using a bathroom floor component according to another embodiment of the present disclosure may comprise machining a foam and/or plastic floor member having at least one sloped surface extending downwardly toward a drain aperture, further machining from the same piece of foam and/or plastic a raised platform strengthening member at least partially surrounding the floor member, the raised platform strengthening member adapted to be placed in registry with the pod walls to at least partially support the weight of the pod walls, machining voids in the raised platform strengthening member adapted to receive anti-compression elements which will serve to support some or all of the weight of the pod walls, and associating the anti-compression elements with the voids. The raised platform strengthening member and/or the anti-compression elements may be provided with apertures suited to receiving fasteners to connect the bathroom floor component to lower ends of the pod walls. The method of fabricating in this embodiment comprises encapsulating the entirety of the bathroom floor component in a waterproof layer.

A method of fabricating and using a bathroom floor component according to a still further embodiment of the present disclosure may comprise machining one or more plastic and/or foam floor members with a contour, providing one or more transverse strengthening members and one or more peripheral strengthening members, associating the foam and/or plastic floor members with the one or more transverse strengthening members and the one or more peripheral strengthening members, and attaching the foam and/or plastic floor members to the one or more transverse strengthening members and the one or more peripheral strengthening members.

A method of fabricating and using a bathroom floor component according to another embodiment of the present disclosure may comprise machining one or more foam and/or plastic floor members, providing one or more transverse strengthening members, associating the foam and/or plastic floor members with the one or more transverse strengthening members, and attaching the foam and/or plastic floor members to the one or more transverse strengthening members

A still further method comprises providing a raised peripheral support platform around at least a portion of a periphery of the two or more foam and/or plastic floor members.

In some embodiments, an even further method comprises the provision of a reinforcing member such as a metal frame associated with, and supporting an underside of, the raised peripheral support platform and/or the underside of one or more portions of floor of the bathroom floor component

In embodiments, the bathroom floor component is encapsulated in a waterproof shell on some or all sides, which adds to the strength and water imperviousness thereof.

A prefabricated bathroom pod according to another embodiment of the present disclosure may comprise a ceiling, a plurality of walls, and electrical wiring and plumbing accessories, as well as a bathroom floor component supported by a support substrate. In one embodiment, the floor component that is supported by the substrate is encapsulated in a waterproof shell. In another embodiment, the floor component and a portion or all of the substrate are both encapsulated in a waterproof shell. In a third embodiment, the floor component, the floor substrate and a raised peripheral platform are all encapsulated in a waterproof shell. In a forth embodiment, the floor component includes a support frame, where one or more portions of the support frame may be encapsulated in a waterproof shell and/or one or more portions may not be so encapsulated.

In still further embodiments, a bathroom floor component of prefabricated bathroom pod may be comprised of a single bathroom floor panel which is made of a material that is impervious to water, such as closed cell foam or polyethelene. In such embodiments, a single closed cell floor panel could be used for the bathroom floor, which would not

necessarily need to be encapsulated in a waterproof shell, although encapsulating the floor component in a waterproof shell could optionally be done.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a bottom exploded perspective view of a bathroom pod constructed with a prefabricated bathroom floor component according to a first embodiment of the present disclosure.

FIG. **2**A is a top perspective assembled view of the bathroom pod of FIG. **1** constructed with a prefabricated bathroom floor component of FIG. **4**A.

FIG. **2**B is an enlargement of the area of detail shown in FIG. **2**A, showing a corner of the prefabricated bathroom floor component fastened to the walls of the bathroom pod.

FIG. **2**C is a front elevational sectional view of the bathroom pod of FIG. **2**A, taken along lines **2**C-**2**C thereof.

FIG. **2**D is a side elevational sectional view of the bathroom pod of FIG. **2**A, taken along lines **2**D-**2**D thereof.

FIG. **3**A is an enlargement of the area of detail shown in FIG. **2**C, showing internal details of the fastened connection of the prefabricated floor component to the walls of the bathroom pod.

FIG. **3**B is a modified form of the enlarged area of detail shown in FIG. **2**C.

FIG. **3**C is a further modified form of the enlarged area of detail shown in FIG. **2**C.

FIG. **3**D is a still further modified form of the enlarged area of detail shown in FIG. **2**C

FIG. **4**A is a top oriented perspective view of a prefabricated bathroom floor component that is similar or identical to that depicted in FIG. **1** prior to being encapsulated with a waterproof strengthening membrane and which employs a perimeter peripheral member. An opening without a raised wall platform, where a door may be installed, is shown toward the front of the prefabricated bathroom floor component.

FIG. **4**B is a top oriented perspective view of a prefabricated bathroom floor component that is similar or identical to that depicted in FIG. **1** prior to being encapsulated with a waterproof strengthening membrane and which employs a reinforced peripheral strengthening member, and a border member.

FIG. **4**C is a top oriented perspective view of a prefabricated bathroom floor component that is similar to that depicted in FIG. **4**A prior to being encapsulated with a waterproof strengthening membrane and which does not employ a transverse strengthening member.

FIG. **4**D is a top oriented perspective view of a prefabricated bathroom floor component that is similar to that depicted in FIG. **4**B prior to being encapsulated with a waterproof strengthening membrane and which does not employs a transverse strengthening member

FIG. **5**A is a bottom oriented perspective view of the prefabricated bathroom floor component of FIG. **4**A.

FIG. **5**B is a bottom oriented perspective view of the prefabricated bathroom floor component of FIG. **4**B.

FIG. **5**C is a bottom oriented perspective view of the prefabricated bathroom floor component of FIG. **4**C.

FIG. **5**D is a bottom oriented perspective view of the prefabricated bathroom floor component of FIG. **4**D.

FIG. **6** is a perspective view of the prefabricated bathroom floor component of FIGS. **4-5** after being coated with a waterproof sealant.

FIG. **7**A is a cross-sectional exploded elevational view of the embodiment of a prefabricated bathroom floor component shown in FIG. **3**A.

FIG. **7**B is a cross-sectional exploded elevational view of the embodiment of a prefabricated bathroom floor component shown in FIG. **15**B.

FIG. **7**C is a cross-sectional exploded elevational view of the embodiment of a prefabricated bathroom floor component shown in FIG. **15**C.

FIG. **7**D is a cross-sectional exploded elevational view of the embodiment of a prefabricated bathroom floor component shown in FIG. **18**D.

FIG. **7**E is a cross-sectional exploded elevational view of the embodiment of a prefabricated bathroom floor component shown in FIG. **23**.

FIG. **8**A depicts a waterproof sealant being applied to the prefabricated bathroom floor component of FIG. **3**A.

FIG. **8**B depicts a waterproof sealant being applied to the prefabricated bathroom floor component of FIG. **15**C.

FIG. **8**C depicts a waterproof sealant being applied to the prefabricated bathroom floor component of FIG. **15**D.

FIG. **8**D depicts a waterproof sealant being applied to the prefabricated bathroom floor component of FIG. **18**D.

FIG. **8**E depicts a waterproof sealant being applied to the prefabricated bathroom floor component of FIG. **23**.

FIG. **9**A is a flow chart depicting a method of manufacture and use of prefabricated bathroom floor components according to an embodiment of the present disclosure.

FIG. **9**B is a flow chart depicting a method of manufacture and use of prefabricated bathroom floor components according to another embodiment of the present disclosure.

FIG. **9**C is a flow chart depicting a method of manufacture and use of prefabricated bathroom floor components according to a further embodiment of the present disclosure.

FIG. **10**A is a flow chart depicting the method of manufacture and use of prefabricated bathroom floor components according to FIG. **9**A.

FIG. **10**B is a flow chart depicting the method of manufacture and use of prefabricated bathroom floor components according to FIG. **9**B.

FIG. **10**C is a flow chart depicting the method of manufacture and use of prefabricated bathroom floor components according to FIG. **9**C.

FIG. **11** is an exploded perspective view of a bathroom pod constructed with a prefabricated floor component according to a third embodiment of the present disclosure.

FIG. **12** is a perspective assembled view of the bathroom pod constructed with a prefabricated bathroom floor component of FIG. **11**.

FIG. **13** is an enlarged detail view taken from FIG. **12**.

FIG. **14** is a front cross-sectional elevational view of the bathroom pod of FIG. **12**, taken along lines **14-14** thereof.

FIG. **15**A is a side cross-sectional elevational view of the bathroom floor component of FIG. **12**, taken along lines **15**A-**15**A thereof.

FIG. **15**B is an enlarged detail view taken from FIG. **14**, showing the internal details of the fastened connection of the prefabricated bathroom floor component to the walls of the bathroom pod.

FIG. **15**C is an enlarged detail view taken from FIG. **14**, showing alternative internal details of the fastened connection of the prefabricated bathroom floor component to the walls of the bathroom pod.

FIG. **16**A is a top oriented perspective view of a prefabricated bathroom floor component before completion.

FIG. **16**B is a bottom oriented perspective view of the prefabricated bathroom floor component of FIG. **16**A.

FIG. **17**A is a top perspective view of the bathroom floor component of FIG. **16**A after being encapsulated in a waterproof membrane.

FIG. **17**B is a bottom perspective view of the bathroom floor component of FIG. **16**B after being encapsulated in a waterproof membrane.

FIG. **18**A is a top plan view of a prefabricated bathroom floor module according to a third embodiment of the invention.

FIG. **18**B is a bottom plan view of the bathroom floor component of FIG. **18**A.

FIG. **18**C is a cross-sectional elevational view of the bathroom floor component taken along lines **18**C-**18**C of FIG. **18**A.

FIG. **18**D is a cross-sectional elevational view of the floor module taken along lines **18**D-**18**D of FIG. **18**A.

FIG. **18**E is a top perspective view of the bathroom floor component of FIG. **18**A without longitudinal or anti-compression elements.

FIG. **18**F is a bottom perspective view of the bathroom floor component of FIG. **18**A without longitudinal or anti-compression elements.

FIG. **18**G is a top perspective view of the bathroom floor component of FIG. **18**A with anti-compression elements.

FIG. **18**H is a bottom perspective view of the bathroom floor component of FIG. **18**A.

FIG. **18**I is a top perspective view of the bathroom floor component of FIGS. **18**E and **18**G after being coated with a waterproof sealant.

FIG. **18**J is a bottom perspective view of the bathroom floor component of FIGS. **18**F and **18**H after being coated with a waterproof sealant.

FIG. **19** is a perspective exploded view of a fourth embodiment of the invention.

FIG. **20** is a bottom plan exploded view of representative floor sections thereof.

FIG. **21**A is a top plan assembled view of the bathroom floor component of the fourth embodiment after assembly and coating with a waterproof membrane.

FIG. **21**B is a bottom plan assembled view of the bathroom floor component of the fourth embodiment after assembly and coating with a waterproof membrane.

FIG. **22**A is a cross-sectional elevational view taken along lines **22**-**22** of FIG. **21**.

FIG. **22**B is a cross-sectional elevational view taken along lines **22**-**22** of FIG. **21**, but where the floor member is comprised of two stacked floor panels.

FIG. **23**A is a cross-sectional elevational view taken along lines **23**-**23** of FIG. **21**.

FIG. **23**B is a cross-sectional elevational view taken along lines **23**-**23** of FIG. **21**, but where the floor member is comprised of two stacked floor panels.

FIGS. **24**-**26**B depict a fifth embodiment of the invention, which is substantially the same as the embodiment shown in FIGS. **19**-**23** but with a single-panel floor member.

FIG. **24** is a perspective exploded view of a fifth embodiment of the invention.

FIG. **25** is a bottom plan view of the bathroom floor component of FIG. **24**.

FIG. **26**A is a top plan view of the bathroom floor component of FIGS. **24** and **25** after being coated with a waterproof membrane.

FIG. **26**B is a bottom plan view of the bathroom floor component of FIGS. **24** and **25** after being coated with a waterproof membrane.

FIG. **27** is a bottom exploded perspective view of a bathroom pod constructed with a prefabricated bathroom floor component according to a sixth embodiment of the present disclosure.

FIG. **28** is a top perspective view thereof.

FIG. **29** is a close up of the area of detail shown in FIG. **28**.

FIG. **30** is a cross-sectional elevational view taken along lines **30**-**30** of FIG. **28**.

FIG. **31** is a cross-sectional elevational view taken along lines **31**-**31** of FIG. **28**.

FIG. **32**A is an enlargement of the area of detail shown in FIG. **30**, showing internal details of the fastened connection of the prefabricated floor component to the walls of the bathroom pod.

FIG. **32**B is a modified form of the enlarged area of detail shown in FIG. **32**A.

FIG. **33** is a top oriented perspective view of a prefabricated bathroom floor component that is similar or identical to that depicted in FIG. **27** prior to being encapsulated with a waterproof strengthening membrane.

FIG. **34** is a top oriented perspective view of the prefabricated bathroom floor component of FIGS. **27** and **33** after being coated with a waterproof sealant.

FIG. **35** is a bottom oriented perspective view of the prefabricated bathroom floor component of FIGS. **27** and **33** after being coated with a waterproof sealant.

DETAILED DESCRIPTION

Reference will now be made in detail to embodiments of the disclosure, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or like parts. In some cases, a reference number will be indicated in this specification and the drawings will show the reference number followed by a letter for example, **100***a*, **100***b* or a prime indicator such as **100'**, **100"** etc. It is to be understood that the use of letters or primes immediately after a reference number indicates that these features are similarly shaped and have similar function such as is often the case when geometry is mirrored about a plane of symmetry. For ease of explanation in this specification, letters or primes will often not be included herein but may be shown in the drawings to indicate duplications of features discussed within this written specification.

Accordingly, the apparatus components have been represented where appropriate by conventional symbols in the drawings, showing only those specific details that are pertinent to understanding the embodiments of the present invention so as not to obscure the disclosure with details that will be readily apparent to those of ordinary skill in the art having the benefit of the description herein.

The embodiments of the present disclosure typically include combinations of structural components and manufacturing, installation and use steps related to the creation of a variety of bathroom floors including shower floors that may be used in a bathroom floor component or the like.

In this document, relational terms, such as "first" and "second," "top" and "bottom," and the like, may be used solely to distinguish one entity or element from another entity or element without necessarily requiring or implying any physical or logical relationship or order between such entities or elements.

The terms "comprises," "comprising," "comprise", "including", "include" or any other variation thereof are intended to cover a non-exclusive inclusion, such that a

process, method, article, or apparatus that comprises a list of elements need not necessarily include only those elements, but may include other elements not expressly listed or inherent to such process, method, article, or apparatus.

The term "plurality of" as used in connection with any object or action means two or more of such objects or actions.

As used herein, the articles "a" and "an" are intended to include one or more items, and may be used interchangeably with "one or more." Where only one item is intended, the term "one" or similar language is used. Also, as used herein, the terms "has", "have", "having", "with" or the like are intended to be open-ended terms. Further, the phrase "based on" is intended to mean "based, at least in part, on" unless explicitly stated otherwise.

Terms such as "wall coverings", "floor covering", "wall or flooring material," "floor and wall covering," "flooring material" and "covering material" mean one or more of ceramic, natural stone or other tile, stone, granite, marble, cultured marble, solid surface, or any other surface (e.g. stone), or non-slip finished shower surfaces such as vinyl, epoxy, or plastic, stucco, concrete and mortar surfaces, whether or not applied or combined with adhesives or other substances, and any other material or materials used to provide a finished surface.

The term "tiled" means any surface having floor or wall covering materials, such as one or more of ceramic, porcelain, natural stone or other tile, stone, granite, marble, cultured marble, solid surface or any other surface (e.g., stone), or non-slip finished shower surfaces such as vinyl, epoxy, or plastic, stucco, concrete and mortar surfaces, whether or not applied or combined with adhesives or other substances, and any other material or materials used to provide a finished surface.

The term "non tileable" means one or more surfaces or structural components which are not capable of receiving wall or floor material or were not designed, marketed or sold with the intention of being tileable or tiled, and in fact are not tiled.

The term "tileable" or "ready-to-tile" means one or more surfaces or structural components which are capable of receiving wall or flooring material, whether through the use of adhesives or any other means of attachment, such as clips, straps or other mechanical fastening structure(s).

A "fastener" or "fastening" may include anything known in the art for fastening including, but not limited to, cap screws, bolts, screws, clips, adhesives, etc.

The term "standard drain" or "drain assembly" means any kind of drain made of any kind of material, including but not limited to metal or plastics, and with any kind of connection to a drain system such as a waste water system, including but not limited to a solvent weld drain, a welded connection drain, a hub (outside caulk) drain, a spigot drain, a hubless spigot drain, a hubless drain, an inside caulk (gasket) drain, a hubbed (push on) drain, a compression drain, and a clamping ring drain.

The term "trench drain" means any linear drain and any linear trench adapted to direct water to a building drain, and contemplates any type of drain fixture.

The term "drain area" or "drain aperture" means an area in which a drain is either to be formed or installed, or is actually formed or installed, in a shower pan and/or bathroom floor.

The term "molded" means any component that is formed with a finished product at the time that the finished product is molded.

The term "plastic" means any foam, plastic, polyurethane, PVC, ABS, polyethylene or other material having characteristics similar thereto.

The term "foam" means any rigid polyurethane foam or any other material having characteristics similar thereto.

The terms "pitch" or "slope" mean the change in elevation per unit of length of floor. A typical shower floor pitch is ¼" per foot, although any pitch is deemed to be within the scope of the inventions disclosed herein. Non shower pitch areas typically would have pitch which is between ⅛' per foot to 1/16" per foot more or less. Shower surfaces and non-shower wet areas are typically pitched toward the drain, encouraging water to flow to the drain. Dry pitched areas may or may not be pitched to a drain.

As used herein, a "frame member" or "strengthening member" may be a structural strength enhancing member that is made from any material that will have the tendency to increase the strength of the bathroom floor components of this invention when incorporated into such bathroom floor components, and may have a thickness of ¼" inch to 2 inches more or less, along with any length and width.

As used herein, an "anti-compression member" is a weight-supporting element adapted to be incorporated into or otherwise used to support weight to avoid deformation of a component or structure by a weight-bearing object.

As used herein, a "concrete member" or "concrete frame member" is a frame member made or cut from concrete wall board or porcelain cement or the like, and may have any thickness, for example ½ inch to 2 inches. Other forms of concrete or cement may be used to manufacture a concrete member, etc.

As used herein, a "foam and/or plastic member" may be any type of foam or plastic material such as polyurethane, PVC, ABS, polyethelene, and other plastics and/or foam, including an XPS (extruded polystyrene) foam that is commercially available, that is cut or manufactured to size, and that may be of any desired density depending on the specific need for such foam and/or plastic member. Other types of foam and plastic may be used to manufacture a foam and/or plastic member.

As used herein, a "bathroom pod," "prefabricated pod bathroom," "bathroom pod chamber," or the like, is a prefabricated, portable pod, from time of manufacture to time of final installation, comprising bathroom features such as one or more floor areas, walls, ceiling, plumbing fixtures, electrical features, decorative floor and wall covering material, etc.

The embodiments disclosed herein may be employed in, by example but not by way of limitation, residential single and multi-family complexes, hospitals, health care facilities, nursing homes, assisted living and aging in place facilities dormitories, hospitality facilities, hotels, military housing, time shares, commercial, military, student and/or industrial facilities, and any other installations in which one or more bathrooms pods are incorporated into the construction.

First, a prefabricated bathroom chamber or bathroom pod, or pod or a bathroom pod floor component that may be employed according to one or more embodiments of the present disclosure suitable for building commercial projects, will be discussed. Then, a pod bathroom floor component that may be used in such a bathroom pod or other similar applications, as a replacement in the field, or in a custom application, will be discussed. Later herein, a method for fabricating and/or using one or more component embodiments will be described. This methodology will be repeated for similar or related embodiments.

Representative Prefabricated Bathroom Pod with a Raised Peripheral Strengthening Wall-Support Platform

Given the size of the typical bathroom pod floor component and the weight of the bathroom pod once assembled, a robust method for resisting sagging, twisting, bending and other destructive forces during lifting, transport and installation of the bathroom pods is desired, as well as the needed structure to strengthen the floor component and support the weight of the bathroom walls and wall coverings, bathroom floors and floor coverings, accessories and ceiling panel.

A bathroom pod **100** according to an embodiment of the present disclosure will now be discussed with reference to FIGS. **1-6**. The bathroom pod **100** as shown may comprise a ceiling **102**, a plurality of walls **104**, electrical wiring **106**, plumbing **108**, and a bathroom floor component **300**/**300** *a*. As shown in FIGS. **4** and **5**, the underlying bathroom floor component **300** may include one or more transverse strengthening members **302**, which strengthening members may be made of wood, concrete wallboard material (e.g., HARDIE™ board manufactured by JAMESHARDIE™ Building Products, Inc.) porcelain, metal, extruded thermoplastics, reinforced thermoplastics, etc, or the like, and that is adhered to one or more foam floor panels **304**.

As seen in FIG. **6**, one or more floor panels **304** (and strengthening members **302** if present) are not typically seen in the finished bathroom floor component **300** as assembled since the entire floor component **300** is encapsulated in a waterproof material, creating an encapsulation layer **325**, which will be discussed in more detail below. The operative wall and floor areas of the pod **100** (including encapsulation layer **325**) are usually covered by decorative and/or functional wall and floor covering **390**, **394**, respectively, such as wall and floor tile, respectively, or the like, as is well known. An ingress/egress area **180** may be provided to permit unencumbered access to the bathroom pod.

Further, in some embodiments, a weight bearing raised platform **376** for supporting the pod walls is formed from the same one or more foam floor panels **304** referenced above to create a raised peripheral planar wall support surface **377** defining an outer raised platform perimeter of bathroom floor component **300**. Additionally, one or more of the foam floor panels **304** may define a drain aperture **378**, and define sloped upper surfaces **380** that are directed toward the drain aperture **378**.

Typically, as seen in FIGS. **1-3**, the walls **104** may connect the ceiling **102** to the bathroom floor component **300**, the electrical wiring **106** is attached to at least one of the plurality of walls **104** and/or the ceiling **102**, and the plumbing **108** is attached to at least one of the plurality of walls **104** or the bathroom floor component **300**. It is contemplated that the ceiling and/or one or more of the plurality of walls and/or plumbing fixtures/accessories may be omitted from the pod **100** in embodiments of the present disclosure. Also, various light and plumbing fixtures, or any other accessories, may or may not be present. Also, the walls may be supported by a plurality of strengthening members associated with the raised platform which strengthening members would be selected from the group of compression-resistant materials and products such as polyurethane, wood, bushings and grommets. In other embodiments, ceiling **102** may be manufactured and employed in the manner described in connection with bathroom floor component **300**.

Put another way, the walls may connect the ceiling to the bathroom floor component **300**. The walls may include bottom frame members **112** which are adapted to align and be coplanar with upper surface **377**. A plurality of hollow fastener-receiving journals or bushings **116** may be disposed in the plurality of apertures **114** defined by raised platform **376**. These journals **116** may act as alignment features when the walls are fastened to the bathroom floor component **300**, act to protect the integrity of apertures **114**, which in some embodiments are formed in polystyrene or other relatively soft foam, and in other embodiments a more rigid foam such as polyurethane, and act to transfer weight from the walls **104** to the sub-floor (not shown) supporting pod **100**. In doing so, the raised platform **376** is protected from crushing. The hollow interiors of bushings **116** allow fasteners **120** to extend through apertures **114** in raised platform **376** through the bottom wall of frame members **112** (see FIGS. **2**C, **2**D and **3**). As seen in FIGS. **4***b* and **5**B, anti-compression members **379**, which may be wood, polyurethane, metal or any other material or apparatus, may be incorporated within the raised platform **376** to help in transferring the weight of the pod walls **104** from the raised platform to the sub floor (not shown). One or more of any of the raised platform anti-compression members **379** may be used in any combination in the raised platform. In embodiments, voids for receiving the anti-compression members **379** and are machined into platform **376**. In other embodiments, such voids are created during manufacturing of the raised platform.

Focusing on FIG. **3**A, it can be seen that the bushings **116**, which are preferably fabricated of metal, although any material having good compression resistance is suitable, transfer weight from the walls down to the support surface or substrate (not shown) on which the bathroom floor component **300** will sit. Any suitable fastener **120** may be used including nuts and bolts, screws, adhesive, and the like. Bottom frame members may be in the form of standard U-shaped channels, rectangular structural members such as 2×4 s or 4×4 s, or the like, to which are attached the wall studs **110**. The U-shaped channels and/or rectangular structural members **112** may be referred to as a bottom wall strengthening member, bracket, track or tray, and may be used to connect the wall studs **110** to the upper surface **377** of raised platform **376**. The U-shaped channels and/or bottom frame members **112** are preferably aligned with the upper surfaces **377** of raised platform **376**. The fasteners **120** may engage one or more of the bottom frame members **112** through apertures **114**. In embodiments, the bushings **116** may be disposed in the apertures **114**, which then support the bottom frame members **112** and the anti-compression members as applicable. The fasteners **120** may extend through the bushings **116** so that the bushings **116** surround the fasteners **120**.

Similarly, FIGS. **2**A thru **2**D depict the bathroom pod **100** as assembled. Some of the plumbing accessories are more easily seen including the shower accessories. Other features, configurations, and accessories are possible in other embodiments of the present disclosure.

The ceiling **102** may be monolithic, crack-proof, and water proof. The electrical wiring **106** and the plumbing **108** may be pretested and code compliant. The walls **104** may have moisture, mold and abuse resistant wallboard **107**. Engineered steel framing studs **110** may hold the walls, and the pod floor component **100** as a whole, together. Accessories such as, but not limited to, a sink **115**, rail **118**, mirror **111** and foot rest **113** may also be provided. One or more of these features or accessories may be omitted in other embodiments of the present disclosure.

As can be seen, any completed, prefabricated bathroom chamber or pod such as pod **100** may speed up construction of a building by providing a completely finished modular room that is clean and ready for installation and use. Once

properly positioned, physical placement within the building as well as plumbing and wiring hook ups are all that is needed before the bathroom is operational.

Turning to FIGS. **4** and **5**, it can be understood that the bathroom pod floor component **300** is assembled as a collection of component parts, comprising (as will be seen in connection with FIGS. **7-10**) one or more floor panels encapsulated within a one piece, waterproof, rigid layer **325** to result in a monolithic, extremely strong bathroom floor member that resists bending, sagging and twisting. The pre-encapsulated bathroom floor as shown in FIGS. **4**A, **4**B, **5**A and **5**B may comprise any number of transverse strengthening members or stringers **302**. One or more foam floor-forming members **304** may be disposed between the one or more plurality of strengthening members **302**. More particularly, at least one of the plurality of foam floor members **304** may be disposed between adjacent transverse cross-brace strengthening members **302**. In some embodiments, a single longitudinal strengthening member **302** and two panels of foam **304** may be employed, etc. to form the bathroom floor component **300**. In other embodiments, the floor and perimeter raised platform **376** are formed of a single sheet of closed cell foam, and may or may not be encapsulated in the waterproof rigid layer.

More specifically, at least one or more of the plurality of foam members **304** may be bonded to at least one or more of the plurality of outside peripheral strengthening members **374**, and to at least one or more of the plurality of transverse cross-brace strengthening members **302**. The bonding may be intermittent or may cover substantially the entire interface between the foam member and the peripheral strengthening member. Any suitable bonding agent may be used, such as glue, latex modified rapid setting material, etc., as will occur to those of skill in the relevant art.

As best seen in FIGS. **4-5**, one of the foam members **304** may define a drain aperture **378**. The drain aperture **378**, as well as any contour, e.g., slope or pitch to the upper surface of floor panels **304**, may be milled or drilled, etc. using a CNC (computer numerically controlled) router or milling machine, or other aperture-forming technique, etc. Alternatively, such structural features may be formed in a molding process. In like manner, contour, e.g., support ribs (not shown), may be formed in the lower surface of floor members **304**. Later, a drain assembly (such as the linear trench and linear drain **391** shown in the figures, or a circular drain, etc. may be inserted into the drain aperture **378** during the fabrication of the bathroom floor component as will be discussed in more detail below.

As seen in FIGS. **4**B, **5**B and **6**, a modified floor component **300***a* employs a prefabricated raised platform **376** having one or more anti-compression elements **379** integrated therewith. The anti-compression elements **379** transfer weight from the pod walls **104** to the substrate which supports the floor component **300***a*. Anti compression elements **379** may be comprised of wood, plastic, polyurethane, metal, pvc, concrete, porcelain cement or any suitable material capable of transferring weight forces exerted by the walls (which includes the weight of the ceiling **102** and the accessories and other items attached to the pod **100**) to avoid crushing or otherwise distorting the raised platform **376**. Any number of elements **379** may be employed, with each having the same size or shapes and/or dimensions, or having unique shapes, sizes and dimensions. Alternatively, the raised platform **376** may be comprised entirely of material which is capable of supporting the weight of the walls **104** and attachments thereto.

FIGS. **4**A-**5**B show floor components **300** and/or **300***a* prior to being encapsulated with a waterproof membrane. FIG. **6** shows floor components **300** and/or **300***a* after being encapsulated with a waterproof membrane **325**. As can be seen, strengthening members **302**, as well as the peripheral edges of drain fixture **391**, can no longer be seen after floor component **300**/**300***a* has been encapsulated.

The bathroom floor component **300***c* shown in FIG. **4**C is in most material respects the same as the bathroom floor component of FIG. **4**A, but does not have longitudinal strengthening member(s) **302**. Instead, it is a single-panel floor component. In embodiments, bathroom floor component **300***c* may be coated with waterproof membrane **325**, or may be uncoated, such as in cases where it is manufactured of water impervious material. In the latter case, no additional waterproofing, such as in the form of waterproof membrane **325**, is necessary.

The bathroom floor component **300***d* shown in FIG. **4**D is in most material respects the same as the bathroom floor component of FIG. **4**B, but does not have longitudinal strengthening member(s) **302**. Instead, it is a single-panel floor component. In embodiments, bathroom floor component **300***d* may be coated with waterproof membrane **325**, or may be uncoated, such as in cases where it is manufactured of water impervious material. In the latter case, no additional waterproofing, such as in the form of waterproof membrane **325**, is necessary.

Waterproof Membrane

As stated previously, it has been discovered that encapsulating or coating the bathroom floor component or other constituent element of the floor with a waterproof membrane by applying a waterproof sealant or other water-impervious material to the entire assembly significantly adds to the strength of the bathroom floor component, and also contributes to the watertight quality of the component, though a waterproof membrane may not be required when a one-piece closed cell floor panel and/or raised support platform are used for the bathroom floor component **300**/**300***a*. FIG. **6** shows a representative bathroom floor assembly after having been sprayed with such a membrane **325** during a bathroom floor component manufacturing process. FIGS. **7-8** show that a bathroom floor component, such as components **300** and **300***a*, may be spray coated with a waterproof sealant or other protective waterproof layer **325** to create the waterproof membrane. Other methods of application are possible, including powder coating, baking, curing, etc. Teachings of suitable coating materials, techniques and resulting structures are disclosed in U.S. Pat. Nos. 8,918,926, 9,107,545 and 9,775,472 to Herring, the disclosures of which are incorporated by reference herein as though fully set forth herein.

The bathroom floor component of FIG. **6** may be comprised of, in embodiments, a bathroom floor member **300**/**300***a* made of one or more plastic or foam members **304** attached to one or more longitudinal and/or peripheral strengthening members **302**, **374**, after having been coated with the waterproof membrane **325**. The type of membrane material may vary, but may take the form of any suitable commercially available polyurethane, polyurea, or the like.

FIG. **7**A is a cross-sectional exploded elevational view of the embodiment of a prefabricated bathroom floor component shown in FIG. **3**A. FIG. **7**B is a cross-sectional exploded elevational view of the embodiment of a prefabricated bathroom floor component shown in FIG. **15**B. FIG. **7**C is a cross-sectional exploded elevational view of the embodiment of a prefabricated bathroom floor component shown in FIG. **15**C. FIG. **7**D is a cross-sectional exploded

elevational view of the embodiment of a prefabricated bathroom floor component shown in FIG. **18**D. FIG. **7**E is a cross-sectional exploded elevational view of the embodiment of a prefabricated bathroom floor component shown in FIG. **23**.

FIG. **8**A depicts a waterproof sealant being applied to the prefabricated bathroom floor component of FIG. **3**A. FIG. **8**B depicts a waterproof sealant being applied to the prefabricated bathroom floor component of FIG. **15**C. FIG. **8**C depicts a waterproof sealant being applied to the prefabricated bathroom floor component of FIG. **15**D. FIG. **8**D depicts a waterproof sealant being applied to the prefabricated bathroom floor component of FIG. **18**D. FIG. **8**E depicts a waterproof sealant being applied to the prefabricated bathroom floor component of FIG. **23**.

INDUSTRIAL APPLICABILITY

As seen in connection with FIGS. **9-10**, in practice, a bathroom chamber or pod, and a pod bathroom floor component, which may or may not employ a support and/or strengthening framework, may be designed, specified, sold, manufactured, bought, etc., in the commercial or custom application markets according to any of the embodiments discussed herein. That is to say, any of the embodiments described herein may be used to retrofit, repair or refurbish a building or prefabricated bathroom pod, or bathroom floor, or may be used to construct a new bathroom pod for or in a building of any type.

The prefabricated bathroom pods, the bathroom floor components, and any support apparatus disclosed herein may provide easier, quicker and less expensive ways to construct buildings.

It is to be understood that the arrangements disclosed herein are suitable for use with any drain location, even though embodiments are shown using specific drain locations. Such locations are shown for example purposes only, it being understood that the principles of the present disclosure may be applied to create more embodiments.

In broader terms than heretofore discussed, a method for fabricating and/or using embodiments of the present disclosure may be characterized as follows with reference to FIGS. **9-10**.

With reference to FIG. **9**A, the method **400** may comprise the following steps presented in no particular order: step **402** may include positioning either two or more plastic and/or foam floor members **304** that are spaced apart from each other, step **404** may include providing one or more longitudinal strengthening cross-brace members **302**, and step **406** may include attaching each of the one or more plastic and/or foam floor members **304** to the at least one longitudinal strengthening members **302**. Referring still to FIG. **9**A, in some embodiments, the step **406** of attaching at least one or more of the plurality of plastic and/or foam members **304** to at least one or more of the plurality longitudinal transverse strengthening members **302**, includes bonding using an adhesive (see step **408**).

The method **400** may further comprise milling or otherwise rendering a drain aperture in at least one or more of the floor members, and milling the top surface of one or more of the floor members, or portions thereof, with a pitch, such as but not by way of limitation, toward the drain aperture at any appropriate time(s) (step **414**).

In some embodiments, the method **400** may further comprise applying a waterproof sealant to the one or more of the plurality of floor members and the longitudinal strengthening member(s) **302** (step **416**).

Looking now at FIG. **10**A, another method **500** of fabricating a pod bathroom floor component will now be described.

The method **500** may comprise machining a first plastic and/or foam floor member with at least one sloped surface extending downwardly toward a drain aperture and a peripheral strengthening raised platform member (step **502**), machining a second foam floor member with a peripheral strengthening raised platform member (step **503**), providing one or more longitudinal strengthening member(s) (step **504**), joining the first and second floor members to opposite side edges of the longitudinal strengthening member (step **506**), and applying a waterproof sealant to the assembly (step **514**).

Step **506** may include attaching the floor members to the longitudinal strengthening member by fastening or bonding using an adhesive (step **510**).

The method may further comprise creating a contour in the upper surface of the longitudinal strengthening member(s) **302** to coincide with the contour of the upper surface of the adjacent floor members to render the upper surfaces of the longitudinal strengthening member(s) **302** coplanar with the contour of the upper surface of the adjacent floor members, to permit application of a floor covering (e.g., floor tile) that is to be attached to the floor members and the longitudinal strengthening member(s), if any (step **516**).

Optionally, a raised peripheral support platform member, such as raised peripheral platform **376** shown in FIGS. **1-6**, **976** shown in FIGS. **18**A through **18**H, **1076** shown in FIGS. **19** through **26**, and **1176** shown in FIGS. **27** through **35**, may be formed in the floor member(s), and in some cases combined with peripheral support and/or framing members disclosed herein, to create a support for the bottoms of pod walls **104**.

As alluded to earlier herein, once the floor component has been manufactured with a wall strengthening raised peripheral platform, then it may be attached to the walls, and indirectly the ceiling, etc., to make an assembled bathroom pod.

With reference to FIG. **9**B, the method comprises providing a single bathroom floor panel, such as panel **1004** shown in FIG. **24**, and a support frame, such as frame **1050** shown in FIG. **24**. The panel(s) defines a peripheral raised support platform **1076** which in turn defines apertures **120** through which fasteners may be passed to be used during an attachment step to be discussed in more detail below.

At step **414**, a drain aperture is milled or otherwise rendered in the floor panel, as well as any desired floor pitch/slope.

In step **406**, the raised platform **1076** of the bathroom floor component is placed in registry with the floor frame **1050**

The bathroom floor panel **1004** and frame **1050** are then coated with a waterproof coating **325** as described above, which not only creates a waterproof floor component but adds significant strength and rigidity to the bathroom floor component and, thereby, to the pod overall.

The raised support platform **1076** coincides substantially with a footprint defined by lower edges of the pod walls **104**. The lower edges of the pod walls **104** are placed in registry with the raised platform **1076** and fastened to the pod walls **104**. Wall and floor covering material such as wall and floor tile **390**, **394** may thereafter be applied to the pod walls and floor in a manner well known to those skilled in the art. A sturdy pod is thus created, and can be transported to and installed at a construction site.

FIG. **10**B depicts a process for manufacturing a pod bathroom floor component using a floor member comprised of a single floor panel, such as panel **1004** of FIGS. **24-26**. In this embodiment, a pod bathroom floor component is produced by providing a single floor panel which defines raised support platform **1076**, providing floor contour to an upper surface of the floor panel, including a drain aperture, placing the raised platform **1076** of the bathroom floor component in registry with the lower edges of the pod walls **104**, and fastening the floor component to the pod walls. Wall and floor covering material, such as wall and floor tile **390**, **394**, may be applied to the pod walls and floor in a manner well known to those skilled in the art.

FIG. **9**C shows a further method comprised of: providing two or more bathroom floor panels, such as panels **1004**L, **1004**R shown in FIG. **19**, and a support frame, such as frame **1050** shown in FIG. **19**. The panels define a peripheral raised support platform **1076** which in turn defines apertures **120** through which fasteners may be passed to be used during an attachment step to be discussed in more detail below.

At step **414**, a drain aperture is milled or otherwise rendered in one of the floor panels, as well as any desired floor pitch/slope.

In step **406**, the raised platforms **1076**L and **1076**R of the bathroom floor panels **1004**L, **1004**R are placed in registry with the floor frame **1050**.

The bathroom floor panels **10041**, **1004**R and frame **1050** are then coated with a waterproof coating **325** as described above, which not only creates a waterproof floor component but adds significant strength and rigidity to the bathroom floor component and, thereby, to the pod overall.

The raised support platforms **1076**L, **1076**R coincide substantially with a footprint defined by lower edges of the pod walls **104**. The lower edges of the pod walls **104** are placed in registry with the raised platforms **1076**L, **1076**R and fastened to the pod walls **104**. Wall and floor covering material such as wall and floor tile **390**, **394** may thereafter be applied to the pod walls and floor in a manner well known to those skilled in the art.

FIG. **10**C shows a still further process for manufacturing a pod bathroom floor component using a floor member comprised of two or more floor panels, such as panels **1004**L, **1004**R of FIGS. **19-23**. In this embodiment, a pod bathroom floor component is produced by providing a single floor panel which defines raised support platform **1076**L, **1076**R, providing any desired floor contour to an upper surface of the floor panels, including a drain aperture, placing the raised platforms **1076**L, **1076**R of the bathroom floor component in registry with the lower edges of the pod walls **104**, and fastening the floor component to the pod walls. Wall and floor covering material, such as wall and floor tile **390**, **394**, may be applied to the pod walls and floor in a manner well known to those skilled in the art.

Representative Prefabricated Bathroom Floor Component without Weight Bearing Perimeter Raised Platform.

FIGS. **11-17**B depict a further embodiment of the invention, in which bathroom floor component **720** is comprised of one of more longitudinal strengthening members **702**, peripheral strengthening members **774**, and foam floor members **704**. In this embodiment, no perimeter raised platforms are employed, and a third party substrate is provided to support the bathroom floor component.

The bathroom pod **100** as shown may comprise a ceiling **102**, a plurality of walls **104**, electrical wiring **106**, plumbing **108**, and a bathroom floor component. As shown in FIGS. **16**A and **16**B, the underlying bathroom floor component **700** may include at least a first longitudinal strengthening member **702** that is adhered to one or more foam floor panels **704**, which are not typically seen in the bathroom floor component **100** as assembled since the entire floor component **700** is encapsulated in a waterproof material **325**, and usually covered by decorative and/or functional wall and floor covering **390**, **394**, respectively, such as wall and floor tile, respectively, or the like, as is well known. And similarly, bathroom floor component **700** as shown in FIGS. **16**A and **16**B may include one or more perimeter strengthening members **774**, which completely or partially surround(s) foam floor panels **704**. Further, in some embodiments, perimeter strengthening members **774** are attached to peripheral edges of the floor members **704** to define a reinforced outer perimeter of the bathroom floor component **700**. Additionally, one or more of the foam floor panels **704** may define a drain aperture **378**, may employ a circular or linear drain **391** such as a trench drain as shown, and define sloped upper surfaces **380** that are directed toward the drain **391**.

In this embodiment, a support panel or substrate **785** supports and is the substrate for bathroom floor component **700**, and the outer periphery of bathroom floor component **700** fits substantially within the area defined by inner-facing surfaces of wall board material **107**.

Support substrate **785** in turn is attached to bathroom pod **100** in any desirable manner. One such manner is to connect the substrate to the walls **104** of the pod **100**. In embodiments, substrate **785** may be connected to walls **104** by mechanical connection therebetween, an example of which can be seen in the drawings. Fasteners **120**, such as nut and bolt arrangements, may connect the substrate **785** to the pod wall bottom frame members **112**. In this way, the bathroom floor component **700** is supported by substrate **785** and walls **104** when the pod **100** is not supported itself on a floor such as a factory floor, transport vehicle or final building floor slab.

Any suitable fastener **120** may be used including nuts and bolts, dry wall screws and the like. Bottom wall frame members **112** are preferably aligned with upper peripheral surfaces of substrate **785**. The fasteners **120** may engage one or more of the bottom frame members **112** through apertures **714** defined by the substrate **785**.

Typically, as seen in FIGS. **11-15**B, the walls **104** may connect the ceiling **102** to the bathroom floor component **700**, the electrical wiring **106** is attached to at least one of the plurality of walls **104** and/or the ceiling **102**, and the plumbing **108** is attached to at least one of the plurality of walls **104** or the bathroom floor component **700**. It is contemplated that the ceiling and/or one or more of the plurality of walls and/or plumbing fixtures/accessories may be omitted from the pod **100** in other embodiments of the present disclosure. Also, various light and plumbing fixtures, or any other accessories, may or may not be present. In embodiments, ceiling **102** my be manufactured and employed in the manner described in connection with bathroom floor component **700**. An ingress/egress area **180** may be provided.

Similarly, FIGS. **12** thru **15**B depict the bathroom pod **100** as assembled. Some of the plumbing accessories are more easily seen including the shower accessories. Other features, configurations, and accessories are possible in other embodiments of the present disclosure.

The ceiling **102** may be monolithic, crack-proof, and water proof. The electrical wiring **106** and the plumbing **108** may be pretested and code compliant. The walls **104** may have moisture, mold and abuse resistant wallboard **107**. Engineered steel framing studs **110** may hold the walls, and

the bathroom floor component and the pod **100** as a whole, together. Accessories such as, but not limited to, a sink **115**, rail **118**, mirror **111** and foot rest **113** may also be provided. One or more of these features or attributes may be omitted in other embodiments of the present disclosure.

Turning to FIGS. **16**A and **16**B, it can be understood that the bathroom floor component **700** is assembled as a collection of component parts, and (as seen in connection with FIGS. **7-10**) thereafter encapsulated within a one piece waterproof, rigid layer to result in a monolithic, extremely strong floor member that resists bending, sagging and twisting. The pre-encapsulated floor as shown may comprise any number of transverse strengthening members **702** and one or more of a plurality of peripheral outside edge strengthening members **374**. One or more foam floor-forming members **704** may be disposed between the one or more plurality of transverse strengthening members **702** and peripheral strengthening members **774**. More particularly, at least one of the plurality of foam floor members **704** may be disposed between an adjacent cross-brace strengthening member **702** and an outside edge peripheral strengthening member **774**. In some embodiments, a single peripheral strengthening member **774** and a single sheet of foam **704** may be employed, etc., to form the bathroom floor component **700**. The strengthening member(s) **702**, **774** may be bonded or otherwise attached to one or more of the foam floor panels **704**. Any suitable bonding agent may be used, such as glue, latex modified rapid setting material, etc., as will occur to those of skill in the relevant art.

As best seen in FIGS. **16**A-**16**B, one of the foam members **704** may define a drain aperture **378**. The drain aperture **378**, as well as any contour, e.g., slope or pitch to the upper surface of floor panels **704**, may be milled or drilled, etc. using a CNC (computer numerically controlled) router or milling machine, or other aperture-forming technique, etc., or formed using a molding process. In like manner, contour, e.g., support ribs (not shown), may be formed in the lower surface of floor members **704**. Later, a drain assembly **391** (such as the linear trench and linear drain shown in the figures, or a circular drain, etc.) may be inserted into the drain aperture **378** during the fabrication of the bathroom floor component.

FIGS. **16**A and **16**B show floor component **700** prior to being encapsulated with a waterproof membrane **750**. FIGS. **11**, **12**, **14**, **15**A and **15**B show floor component **700** after being encapsulated with a waterproof membrane **325**. As can be seen, strengthening members **702** and **774**, as well as the peripheral edges of drain fixture **391**, can no longer be seen after floor component **700** has been encapsulated.

Alternatively, as seen in FIG. **15**C, the bathroom floor component and the substrate **785** may be mated together prior to applying the waterproof encapsulation layer, and then sprayed or otherwise coated with a waterproofing layer **325**.

Bathroom Floor Components Including Underside Strengthening Members

FIGS. **18**A-**18**F show a third embodiment of the invention along with variations on the embodiment, in which a bathroom floor component is disclosed comprised of one or more foam floor panels **904**, optionally one or more longitudinal strengthening members **902**, and a peripheral raised platform defining a peripheral upper surface **977**. One or more sloped floor surfaces may be provided, as well as one or more drain apertures **378** and one or more drain fixtures **391**. Raised platform **976** may be attached or formed integrally with floor members **904**, or connected thereto using peripheral strengthening members (not shown) such as peripheral strengthening members **374** shown in FIGS. **15** and **16**. In the embodiment shown in FIGS. **18**A-**18**F, strengthening members **374** are not employed. However, it is to be understood that the use of such strengthening members may be included as being within the scope of the invention.

The raised platform **976** is adapted to bear the weight of at least a portion of the walls **104** and ceiling **102** of pod **100**, including the weight of any accessories attached thereto, and as such will be constructed and arranged in such a manner that it can support said weight without distortion (e.g., will resist collapse, crushing or bending). To that end, the material out of which peripheral shoulder **976** is manufactured will be sufficient to support the weight of the ceiling **102** and walls **104**. Alternatively, strengthening inserts **979** and **989** may be integrated into the peripheral raised platform **976** to add weight-bearing and anti-compressive capacity to the raised platform component **976** of the bathroom floor component **900**.

Additionally, the walls **104** of the bathroom pod **100** may connect the ceiling to the bathroom floor component **900**. The walls **104** may include bottom frame members **112** which are adapted to be placed in registry with upper surface **977**. A plurality of hollow fastener-receiving bushings or journals **116** may be disposed in the plurality of apertures **114** defined by raised platform **976**. These bushings **116** may act as alignment features when the walls are fastened to the bathroom floor component **900**, act to protect the integrity of apertures **114**, which in some embodiments are formed in the polystyrene or other relatively soft foam making up support platform **976**, and act to transfer weight from the walls **104** to the sub-floor (not shown) supporting pod **100**. In doing so, the raised platform **976** is protected from crushing. The hollow interiors of bushings **116** allow fasteners **120** to extend through apertures **114** in raised platform **976** through the bottom wall of frame members **112**.

Bushings **116** similar to those depicted in other embodiments herein, such as metal cylindrical journals (not shown), which are preferably fabricated of metal, although any material having good compression resistance is suitable, may be used transfer weight from the walls **104** down to the supporting surface or substrate (not shown) on which the bathroom floor component **900** will sit.

Alternatively or additionally, weight bearing supporting inserts such as intermediate inserts **979** and corner inserts **989** may be used to support the weight of walls **104** and ceiling **102**. Fasteners may be used to attach the walls **104** to the bathroom floor component **900** as described elsewhere in this disclosure, using corresponding apertures **114** defined by support inserts **979** and **989**.

Support straps or bars **990** may be employed to transfer compressive forces from walls **104** to tensile forces exerted within bars **990**. Bars **990** also serve to strengthen bathroom floor component **900**, and ultimately pod **100**, against twisting, bending a sagging action. Preferably, bars **990** are recessed in corresponding slots **991** formed in the lower surfaces of floor panels **904** and transverse strengthening members **902** so as not to add any height dimension to the profile of the bathroom floor component **900**. Bars **990** may be associated with bathroom floor component **900** either before or after floor component **900** is encapsulated with waterproofing sealant **325**. FIGS. **7**D and **8**D depict bathroom floor component **900** being coated with sealant **325** after bars **990** have been associated therewith. It is to be understood that the step of applying sealant **325** may be performed either before or after bars **990** have been associated with floor **900**.

In embodiments, bars **990** connect to walls **104** in the same manner as described in connection with the interconnection of walls **104** with raised support platform **976**.

Bathroom Floor Components with Reinforced Peripheral Support Platform

FIGS. **19-23** depict a further embodiment of the invention, wherein a bathroom floor component **1000** includes one or more floor panels **1004**L, **1004**R provided with a supporting and reinforcing frame **1050**. The frame may be comprised of peripheral raised platform support members **1080**, and may also include, but not necessarily, longitudinal strengthening members **1090**. Support members **1080** are preferably attached to longitudinal strengthening members **1090**, as by welding, bolting or any attachment means. Preferably, the frame members **1080**, **1090** are made of steel or other compression-resistant material. The cross-sectional profile of the frame members may be any shape.

Preferably, as a seen in FIG. **20**, recesses **1086**L and **1086**R are provided in the underside of panels **1004**L and **1004**R to permit panels **1004**L and **1004**R to nest within the peripheral support members **1080**. Likewise, recesses **1092** may be provided in the underside of panels **1004**L and **1004**R to permit longitudinal strengthening members **1090** to nest there within. In this way, the height of the bathroom floor component is kept to a minimum.

Floor panel **1004**L may include sloped surfaces **1027**, a flat surface **1025**, and a drain, such as linear drain **378**. Floor section **1004**R defines an upper surface which may be flat, or maybe sloped as well.

Floor sections **1004**L and **1004**R define raised peripheral support platforms **1077**L and **1077**R adapted to be placed in registry with the pod walls when assembled with the pod. As seen in FIG. **22**, the raised peripheral support platform is integrally formed with floor member **1004**, which adds to the strength of the unitary member. Floor panels **1004**, frame members **1080** and longitudinal strengthening members **1090** are encapsulated in a waterproof membrane prior to being connected with pod walls **104**. Fastening means such as nut and bolt arrangements **120** may be used to connect bathroom floor component **1000** to pod walls **104**. Any other suitable fasteing arrangement may be used. Once so connected, floor and wall tile **390**, **394**, respectively, may be applied to cosmetically finish off the pod. An ingress/egress area **180** may be provided. It is to be understood throughout this disclosure that the frame and the floor panel(s) (and raised peripheral support platform if used) may be encapsulated together within the waterproof membrane, or the floor panel(s) itself (themselves) (and raised peripheral support platform if used) may be encapsulated within the waterproof membrane and, thereafter, the frame associated therewith, such that the frame and floor panel(s) is (are) not integrated within the waterproof membrane together.

In embodiments, the raised peripheral support platform **1076** may be as wide as only the wall **104** and/or wall studs **110**, or may be wide enough to reside in registry with the wall board **107** as well, as seen in FIGS. **22-23**. The raised peripheral support platform **1076** also may be wider or narrower than the wall studs with or without wall board attached.

In the case where the floor member is made up of two panels **1004**L and **1004**R, those panels are joined together at opposed edges **1020**L, **1020**R, as best seen in FIG. **21**. In embodiments, floor panel **1004** is a single piece of foam or plastic (or any other suitable material) that spans the entirety of the frame **1050**. In other embodiments, such as that shown in FIGS. **22**B and **23**B, the floor panel is made up of two or more members. In any embodiment, floor panels may be stacked on top of each other to create a thicker floor, and may be machined in areas to create contour (e.g., slope or drain cutouts).

In embodiments, as shown in FIGS. **24-28**, the floor member may be made from a single, unitary floor panel **1004** defining peripheral raised support platform **1096**, instead of separate panels **1004**L and **1004**R or however many panels may be necessary to cover a given floor area. In the case of larger floor areas, it may be desirable or efficient to utilize more than one floor panel member with frame **1050**, or it may be desirable or efficient to use just a single floor panel such as panel **1004**. In addition or alternatively, it may be desirable or efficient to use a reinforcing frame arrangement that is made of larger or smaller component parts than those shown in the drawings. It is also important to note that the height of any raised peripheral support platform disclosed herein in connection with any embodiment can be specified according to the designer or customer to be whatever height desired for a particular application.

Numerous floor features such as sloped bathroom floor upper surfaces **1004**A and **1004**C, as well as flat bathroom floor area **1048**B, shown in FIG. **24**, may be employed as will occur to those of skill in the art. In addition, in any of the embodiments described in this disclosure, additional or alternative features such as the following may be included:

a. An additional drain or drains may be included in a non-shower area of the bathroom floor member;
b. a second shower may be provided in the bathroom pod;
c. a non-shower pitched wet area may be provided in the bathroom pod;
d. a flat bathroom floor area may be provided in the bathroom pod;
e. non-shower dry pitched bathroom floor area may be provided in the bathroom pod; and/or
f. a shower bench may be provided in the bathroom pod.

Preferably, as a seen in FIG. **25**, recesses **1086** are provided in the underside of panel **1004** to permit panel **1004** to nest within the peripheral support members **1080**. Likewise, recesses **1092** may be provided in the underside of panel **1004** to permit longitudinal strengthening members **1092** to nest there within. In this way, the height of the bathroom floor component is kept to a minimum.

Floor panel **1004** may include optional features such as sloped surfaces **1027**, a flat surface **1025**, and a drain, such as linear drain **378**.

Floor panel **1004** defines raised peripheral support platform **1077** adapted to be placed in registry with the pod walls when assembled with the pod. As seen in FIG. **27**, the raised peripheral support platform is integrally formed with floor member **1004**, which adds to the strength of the unitary member. Floor panels **1004**, frame members **1080** and longitudinal strengthening members **1090** may be encapsulated in a waterproof membrane prior to being connected with pod walls **104**. Fastening means such as nut and bolt arrangements **120** may be used to connect bathroom floor component **1000** to pod walls **104**. Any other suitable fasteing arrangement may be used. Once so connected, floor and wall tile **390**, **394**, respectively, may be applied to cosmetically finish off the pod.

In embodiments, the raised peripheral support platform **1076** may be as wide as only the wall **104** and/or wall studs **110**, or may be wide enough to reside in registry with the wall board **107** as well, as seen in FIGS. **22-23**, and can be narrower or wider than the u-channels which underly the wall studs **110** with or without the wall board.

In any embodiment, the floor panel(s) **1004** may be comprised of two or more thinner panels stacked on top of each other to create a desired floor thickness, and may be machined in areas to create contour (e.g., slope or drain cutouts). In this way, panels that are manufactured to be thinner than the greatest thickness that will be needed for the floor member can be stacked together as shown in FIGS. **22**B and **23**B, as well as **27**B and **28**B, because individual, thinner, floor panels can be manufactured faster and cure faster. The individual panels **1004** can be secured together by adhesive (or simply stacked on top of each other without adhesive), and the top panel (or however many panels are used) can be milled to create contour in the floor member, as well as apertured for one or more drains or any other purpose.

Bathroom Floor Member with Splashwalls and Support Frame

FIGS. **27-35** depict another embodiment of the invention, wherein a bathroom floor component is comprised of a shower member **1100** associated with a support substrate **1150**.

Floor member **1100** preferably includes recessed grooves **1192** into which support frame members **1180**, **1190** nestably relate. Floor member **1100** may also include raised splash walls **1115** around the perimeter thereof other than at the entry or entries to the bathroom. Floor member **1100** also defines an upper floor surface, at least a portion of which tapers toward a drain opening **378**. A suitable drain insert, such as drain insert **391**, may be employed. As will occur to those of skilled in the art, any type of drain may be used in any of the applications of the invention disclosed herein.

In one version of this embodiment, as best seen and FIG. **32**A, the floor member is encapsulated with a waterproofing layer **325** and connected to the support frame **1150**, which in turn is connected to pod walls **104**, after which finishing material such as wall and floor tile **390**, **394** may be attached.

In another version of this embodiment, as shown in FIG. **32**B, shower floor member **1100** and support frame **1150** are both encapsulated with waterproofing material layer **325**, and thereafter attached to pod walls **104**. Thereafter, finishing materials may be applied there too, such as floor and wall tile **394**, **390**.

FIG. **33** is a top perspective view of the shower floor member **1100** of this embodiment. FIG. **34** is the same view as in FIG. **33**, but after waterproofing layer **325** has been applied thereto. FIG. **35** is a bottom perspective view thereof after the waterproofing layer **325** has been applied.

Closed Cell Single Panel Material for Floor Panels, for Raised Platform and/or for Both.

In embodiments, such as shown in FIGS. **4**C and **5**C, **8**D and E, **11**-**17**B, **18**A-**18**I, and **27**-**35**, the floor member of the bathroom floor component may be comprised of a one-piece floor panel manufactured of a water impervious material. In such cases, the waterproof membrane discussed elsewhere in this disclosure may be unnecessary. In other embodiments, the floor panel may be manufactured of a water impervious material but any raised platform may be made of one or more different materials (including anti-compression elements), and vice versa.

Moreover, in any of the disclosed embodiments, one or more of the additional or alternative features such as the following may be included in the bathroom floor component:

a. one or more additional drains (not shown) may be included in a non-shower area of the bathroom floor member;
b. one or more additional showers (not shown) may be provided in the bathroom pod;
c. one or more non-shower pitched wet areas (such as the intermediate areas **904** in FIGS. **18**A and E) may be provided in the bathroom floor component, which is/are designed to become wet and drain water therefrom toward a provided drain;
d. one or more flat bathroom floor areas (such as the area **904** to the far right in FIGS. **18**A and E) may be provided anywhere in the bathroom floor component, defined by the floor member;
e. one or more non-shower dry pitched/sloped bathroom floor areas (not shown) may be provided in the bathroom floor component, defined by the floor member; and/or
f. one or more shower benches (not shown) may be provided in the bathroom pod upon which a user may sit, rest a foot, etc.

Strengthening Members.

Strengthening members such as those described throughout this disclosure, including the anti-compressive members, provide support and rigidity for the bathroom floor components. Certain strengthening members are focused exclusively on strengthening the bathroom floor feature of a bathroom floor component. Other strengthening members are focused exclusively on strengthening the raised platform feature of the bathroom floor component. A third category of strengthening members are focused on strengthening both the bathroom floor feature and the raised platform feature of the bathroom floor component.

Strengthening members can comprise any type of material, including but not limited to wood, metal, plastic, concrete, stone, polyurethane, along with any and all other types of structures or apparatus that would be adequate for peripheral or transverse strengthening purposes. These materials may be used individually and in combination with other materials depending upon the specific support requirements of a specific bathroom floor feature and a specific raised platform feature of a specific bathroom floor component.

For the bathroom floor component strengthening members, their support characteristics are specific to where they are located in the bathroom floor component.

For all embodiments, the heads of fasteners **120** are preferably recessed into the respective apertures **114**, particular at the bottom of raised platforms **376**, **776** and **976**, so as not to unnecessarily add to the height of the bathroom floor component. Appropriate weight-dispersing features such as washers and/or bushings **116** may be employed to distribute forces to the extent necessary to avoid cracking or other disturbance in the waterproof layer **325** or any other aspect of the bathroom floor component.

The top surfaces **377**, **1077** of the raised support platforms in all embodiments are preferably horizontal. Fasteners and fastener-receiving structures are preferably recessed in the raised platform to maintain a uniformly flat and thin profile.

It is understood that the raised platform is not needed where there is a threshold into the bathroom, such as in the doorways shown in FIGS. **1**, **2**A, **11** and **12**. In embodiments, therefore, the raised platform is provided only where pod walls **104** are provided. In this way, ingress and egress to the bathroom will be unimpeded by the peripheral support platforms **376**, **976** and **1076**. Also, as stated previously, it is important to note that the height of any raised peripheral support platform disclosed herein in connection with any

embodiment can be specified according to the designer or customer to be whatever height desired for a particular application.

Frame member **1050** acts as a strengthening member for both the floor and the raised platform, along with providing strengthening to any other member with which it is associated. In this, resistance to bending, twisting and sagging is provided.

It is also to be understood that bathroom pods manufactured in accordance with the description set forth herein are typically set upon substrates, in many cases concrete slabs, in buildings under construction. It is desired to avoid changes in height when going from the substrate/floor of the building into the prefabricated bathroom pod (for example, at an entrance area **180** of any of the floor members described herein) to avoid tripping and/or to meet various disability codes. In some cases, recesses are provided in such building floor substrates to accommodate the depth necessary for sloped shower floors. The bathroom floors of the present invention, containing one or more drains, in most cases employ floors which slope toward such drain(s). The slope of the floors requires the bottom surfaces of the bathroom floor components disclosed herein to have a certain clearance depth accommodated by the substrate, which in appropriate cases is accomplished by creating a recess in the upper surface of the substrate. Preferably, selecting combined dimensions of the thickness of the floor member of the bathroom floor components, and the depth of any recess(es) in the building floor substrate which the bathroom floor member sits in, results in the upper surface of the finished floor of the bathroom floor component immediately adjacent the bathroom pod entrance being at substantially the same height as the finished floor of the building into which the bathroom pod is being installed immediately adjacent the bathroom pod entrance. Alternatively, the height of the unfinished floor at the bathroom pod entrance may be engineered to be at substantially the same height as the adjacent room.

It will be apparent to those skilled in the art that various modifications and variations can be made to the embodiments of the apparatus and methods of assembly as discussed herein without departing from the scope or spirit of the invention(s). Other embodiments of this disclosure will be apparent to those skilled in the art from consideration of the specification and practice of the various embodiments disclosed herein. For example, some of the equipment may be constructed and function differently than what has been described herein and certain steps of any method may be omitted, performed in an order that is different than what has been specifically mentioned or in some cases performed simultaneously or in sub-steps. Furthermore, variations or modifications to certain aspects or features of various embodiments may be made to create further embodiments and features and aspects of various embodiments may be added to or substituted for other features or aspects of other embodiments in order to provide still further embodiments.

Accordingly, it is intended that the specification and examples be considered as exemplary only, with a true scope and spirit of the invention(s) being indicated by the following claims and their equivalents.

What is claimed is:

1. In a premanufactured bathroom pod adapted to be placed on a floor substrate in a building, the premanufactured bathroom pod having a ceiling and a plurality of walls, a reinforced floor system comprising:

a floor member defining a drain opening and an upper surface, at least a portion of the upper surface being sloped toward the drain opening;

a reinforcing frame associated with the floor member adapted to support the floor member;

a waterproof membrane surrounding one or both of the floor member and the reinforcing frame; the floor member defining a raised peripheral support platform adapted to reside in registry with bottom edges of the walls;

recesses defined by a bottom surface of said floor member adapted to receive the reinforcing frame in substantially nested relation so that a bottom surface of said reinforcing frame is substantially coplanar with the bottom surface of said floor member;

a plurality of spaced apertures defined by said raised platform; and

a plurality of spaced apertures defined by said reinforcing frame, said spaced apertures defined by said raised platform being in substantial registry with said spaced apertures defined by said reinforcing frame and adapted to receive fasteners therethrough to attach the reinforced floor system to the walls.

2. The reinforced floor system of claim **1**, wherein the floor member is comprised of two or more floor panels.

3. The reinforced floor system of claim **2**, further comprising longitudinal strengthening members between and interconnecting the two or more floor panels.

4. The reinforced floor system of claim **1**, wherein the floor member is comprised of a first, upper, floor panel and a second, lower, floor panel, the slope of the at least a portion of the upper surface of the floor member being defined by an upper surface of the first, upper floor panel, the recesses being defined by a bottom surface of the second, lower floor panel.

5. The reinforced floor system of claim **1**, further comprising compression resisting members integrated into the raised peripheral platform adapted to transfer weight from said walls.

6. The reinforced floor system of claim **5**, wherein the compression resisting members are metal bushings situated in said spaced apertures, and further wherein the bushings are hollow and adapted to receive said fasteners.

7. The reinforced floor system of claim **5**, wherein the compression resisting members comprise a plurality of spaced apart blocks of material that have higher compression resistance than the raised peripheral support platform.

8. The reinforced floor system of claim **1**, wherein the floor member is polyurethane.

9. The reinforced floor system of claim **1**, wherein the recesses in, and slope of, the at least a portion of the upper surface of the floor member are CNC milled.

10. The reinforced floor system of claim **1**, wherein the floor member includes an entrance area to provide ingress into and egress out of the premanufactured bathroom pod, and wherein an upper surface of the floor member at the entrance area is substantially coplanar with an upper surface of the floor substrate of the building.

11. The reinforced floor system of claim **1**, wherein the floor member includes an entrance area to provide ingress into and egress out of the premanufactured bathroom pod, and wherein an upper surface of the floor member at the entrance area is substantially coplanar with an upper surface of the floor substrate of the building.

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